UPPER TAR RIVER EROSION REPORT

Franklin, Granville, Person & Vance Counties, North Carolina

PHASE V
TAR-NEUSE COOPERATIVE RIVER BASIN STUDY

Prepared By

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Economic Research Service
Forest Service

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UPPER TAR RIVER STUDY

SPECIAL REPORT

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PREFACE

The North Carolina Department of Natural Resources and Community Development requested the Soil Conservation Service (SCS) to study alternatives for watershed protection in the Upper Tar River Basin above US 401 at Louisburg, North Carolina. This study represents Phase V of the Tar-Neuse River Basin Study.

Authorization for USDA participation in the study is provided in Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended). This legislation authorizes the Secretary of Agriculture to cooperate with other federal, state, and local agencies in their investigation of watersheds and river basins to develop coordinated programs of resource use and management.

The Soil Conservation Service had overall responsibility for the study. Basically, this responsibility included the gathering, analysis, review, and preparation of data concerning soil and water related problems and the coordination of other agency input into a final report.

The Forest Service had the responsibility for providing data, inventories, analyses, recommendations, and projections pertaining to forest resources.

The Economic Research Service (ERS) had the responsibility for compiling and analyzing statistics relating to the economic base of the study area. In addition, the ERS developed assessments of economic impacts of plans and alternatives, as well as appraisals of projected yields and resource use.

SUMMARY

Purpose and Authority

This special report presents the results of a study of the Upper Tar River Area of North Carolina conducted by the U. S. Department of Agriculture. The Soil Conservation Service, in cooperation with the Economic Research Service and the Forest Service, had overall responsibility for the study. The objectives of this study were to:

1. Identify the basic water and related land resource problems through concerns as expressed by the people of the area;

2. Determine the magnitude and specific location of significant problems;

3. Forecast the effects of the problems on the area's natural resources;

4. Develop implementable alternatives for reducing soil and water resource problems; and,

5. Present implementation strategies for alleviating the basic resource problems.

Description of the Area

The Upper Tar River Study Area is the Tar River drainage area above Louisburg, North Carolina, consisting of portions of Person, Granville, Vance, and Franklin Counties. The area covers about 277,428 acres (433 square miles). The Tar River originates in eastern Person County and flows southeasterly through Louisburg to Washington, North Carolina where it becomes the Pamlico River. The Pamlico, in turn, flows into Pamlico Sound and into the Atlantic Ocean.

Land use in the Study Area is 20 percent cropland (54,933 acres), 8 percent pasture and hayland (22,511 acres), 66 percent forest land (184,313 acres), and 6 percent other lands (15,230 acres). Urban areas include Oxford, Louisburg, Franklinton, Youngsville, and Henderson.

Problems and Concerns

Problems and expressed concerns of the Upper Tar River Study Area are related to the improvement in the quality of life through development, protection, enhancement, and utilization of the water and land-related resources.

An evaluation of the problems resulted in the recognition of erosion and accompanying sedimentation as the most critical problem. About 90 percent of the area's 55,000 acres of cropland has an annual

erosion rate in excess of acceptable soil loss limits. Sedimentation resulting from excessive erosion contributes to problems of infertile deposition, stream channel filling, and declining water quality and fishery resources.

Water quality of the Tar River system continues to decline. The coastal estuaries, including the Tar River, are experiencing early stages of euthrophication. Nutrients derived from the highly erodible soils of the croplands of the Upper Tar Study Area are high contributors to this problem.

Quality of the aquatic ecosystems is a major concern. Sediment accumulations have filled pool areas and disturbed the riffle-pool ratio to the point where a game fishery is almost nonexistent in most of the streams.

Prime and important lands being used for development purposes are becoming a concern and will be more so in the future as conversion to nonagricultural use occurs. In addition, excessive erosion is depleting the resource base of these important lands.

Wetlands, primarily beaver ponds, are largely unmanaged and the potential for managing such practices as water level manipulation, food plantings, and duck box installation could have particular application in the Upper Tar area.

Alternatives

Three alternatives for reducing the erosion and sedimentation problems have been developed. The first alternative is a continuation of the on-going land treatment program. Alternatives 2 and 3 are directed primarily toward reducing agriculturally-related resource problems through the implementation of selected resource management systems under an accelerated program. Alternative 2 is concerned primarily with the more severely eroding lands only, while Alternative 3 would essentially reduce erosion on all lands to acceptable limits.

Implementation Strategies

Most of the elements of the three alternatives could be implemented with the assistance of a number of existing USDA programs. Six implementation strategies are offered, each emphasizing protection and preservation of the resource base through establishment of land treatment measures.

INTRODUCTION

The Tar-Neuse River Basin Study, authorized by the United States Department of Agriculture in 1971, is a cooperative Federal-State undertaking to identify water and associated land resource problems and to develop alternative plans for solving these problems. The study was initiated at the request of the Governor of North Carolina, to devise remedies for land and water resource problems through the implementation of programs and the management and development of resources that will contribute most to improving the quality of life for all people of the Basin.

During the development of the Tar-Neuse River Basin Study, two problem areas having severe erosion and resulting high sediment damages were identified. These two areas, the Upper Tar (to be studied as Phase V) and Upper Neuse (to be studied as Phase VI), are among the most severely eroded areas in North Carolina. Consequently, several water quality problems exist and there is potential for more serious problems in the future.

Phase V of the study was undertaken to detail alternatives for solving the concerns of loss of resource base and water quality that have been identified in the area of the Tar River above Louisburg, North Carolina. Phase VI will develop detailed alternatives to resolve similar problems in the area of the Neuse River above the Falls-of-Neuse Reservoir.

Five concerns were identified for detailed study and evaluation in this report. These concerns are:

1. Preservation and protection of the resource base.

2. Improvement of water quality.

3. Protection of the fishery resource by maintaining minimum flow.

4. Identification and delineation of prime and important farmlands and forestlands.

5. Identification and delineation of wetlands.

The objectives of this study were to develop implementable alternatives and strategies to address these concerns.

CHAPTER I

GENERAL SETTING

Location and Size

The study area is located entirely in north-central North Carolina (see Map I-1). The hydrologic area covers approximately 277,428 acres, or 433 square miles, and encompasses portions of Person, Granville, Vance, and Franklin Counties. The Tar River originates in eastern Person County and flows southeasterly through Louisburg (outlet of the study area) to Washington, North Carolina where it becomes the Pamlico River. The Pamlico flows into Pamlico Sound and into the Atlantic Ocean. In Person County, streams of the Upper Tar system flow over rocky shoals and some rapids. Stream flow in the lower part of the study area becomes somewhat sluggish. Elevations in the area range from 800 feet in Person County to less than 150 feet at Louisburg.

Climate

Climate in the area is considered mild. Average annual temperature is 60°F. The average January temperature is 42°F, while the warmer July temperature is 78°F. The freeze-free period is about 200 days.

Rainfall averages about 46 inches. July is the wettest month with a rainfall of about six inches. October, the driest month, has about half as much. The rainfall is fairly evenly distributed over the remaining ten months. One or more tropical storms cross the Basin almost every year. All these storms yield heavy rainfall, and many are accompanied by strong winds. The eastern half of the Basin is most frequently affected.

Soils

The Soil Conservation Service and the North Carolina State University have prepared maps of each county in the Upper Tar Study Area showing general soil associations. These maps were used to prepare the General Soil Map of the Basin (see Map I-2). Soil associations occurring in the Upper Tar are listed and described as follows:

> Wehadkee-Chewacla-Roanoke: Soils on nearly level flood plains and low stream terraces. Moderately well drained to poorly drained loamy and clayey soils formed in recent acid alluvium washed from the Piedmont. Occur along Piedmont streams and may also occur along major streams and rivers that originate in the Piedmont and flow seaward through the Coastal Plain. Subject to very frequent flooding. This association represents 0.3 percent of the study area.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

VICINITY MAP

Map I-1

UPPER TAR RIVER BASIN STUDY AREA

Portions of

FRANKLIN, GRANVILLE, PERSON, AND VANCE COUNTIES
NORTH CAROLINA

Material prepared by Field Personnel.
Maps generated by North Carolina Department of Natural Resources and Community Development, Land Resources Information Service.

MARCH 1982 BASE 4-R-37788

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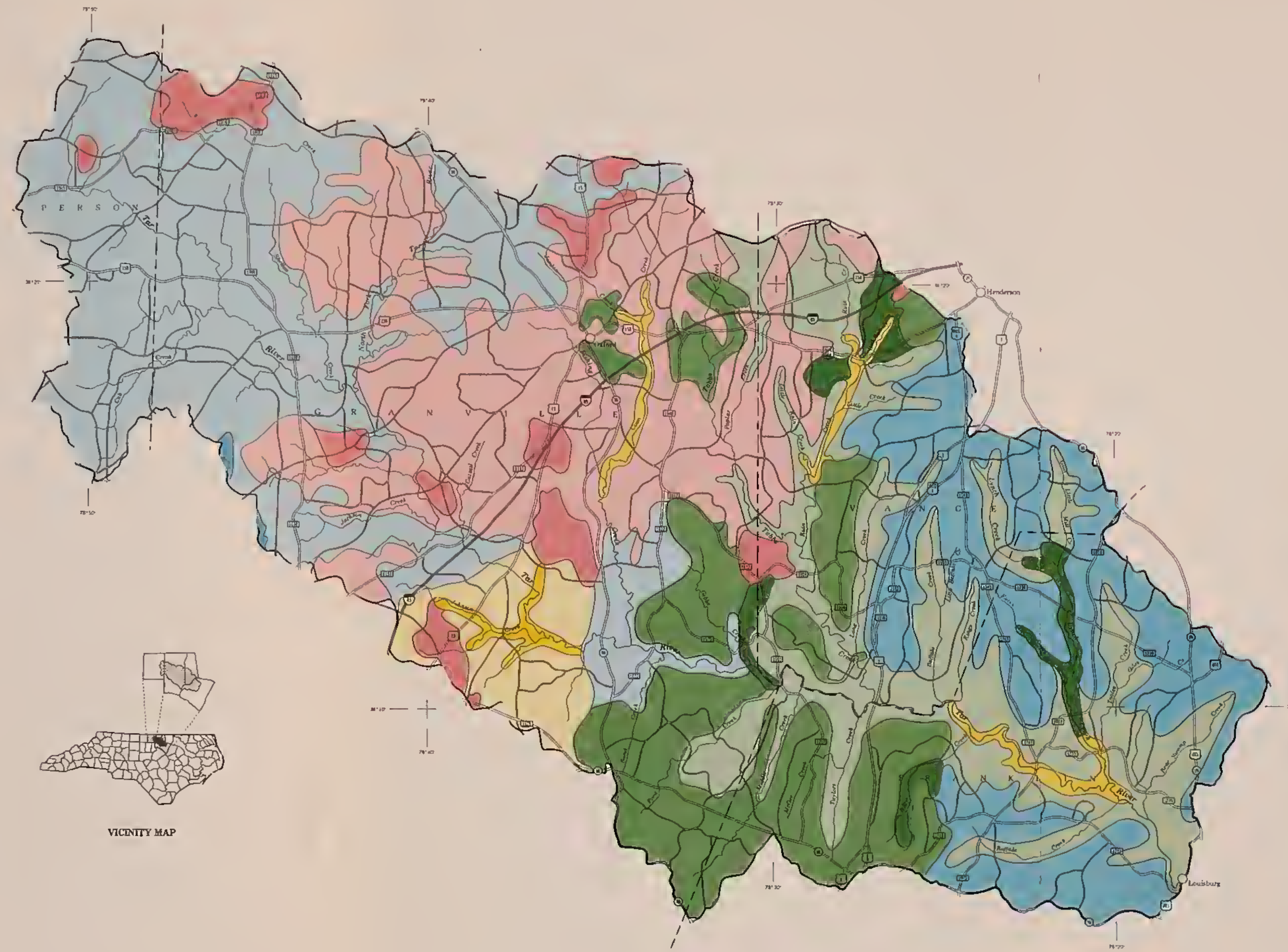
SOIL CONSERVATION SERVICE



BASE LEGEND

- INTERSTATE HIGHWAY
- U. S. HIGHWAY
- STATE HIGHWAY
- SECONDARY STATE HIGHWAY
- INTERSTATE ROAD
- PRIMARY ROAD
- SECONDARY ROAD
- TOWN
- DRAINAGE
- COUNTY BOUNDARY
- STUDY AREA BOUNDARY

LEGEND

- WEHADKEE · CHEWACLA · ROANOKE
- CHEWACLA · WEHADKEE · CONGAREE
- WHITE STORE · CREEDMORE
- GEORGEVILLE · TATUM · HERNDON
- BADIN · GOLDSTON · WILKES
- APPLING · DURHAM
- WEDOWEE · LOUISBURG
- CECIL · MADISON · APPLING
- WILKES
- ENON · HELENA · VANCE
- IREDELL · MECKLENBURG · ENON

Map I-2

GENERAL SOILS MAP

UPPER TAR RIVER BASIN STUDY AREA

Portions of

FRANKLIN, GRANVILLE, PERSON, AND VANCE COUNTIES NORTH CAROLINA

Material prepared by Field Personnel.
Maps generated by North Carolina Department of Natural Resources and Community Development, Land Resources Information Service.

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Chewacla-Wehadkee-Congaree: Soils on nearly level flood plains in Piedmont. Well drained to poorly drained loamy soils formed in recent acid alluvium washed from the Piedmont and mountains. Subject to frequent flooding. Represents 1.2 percent of the study area.

White Store-Creedmoor: Gently sloping to sloping, moderately well drained, deep, highly plastic soils with clayey subsoils formed in mixed basic and acid Triassic residuum. Covers 3.7 percent of the study area.

Georgeville-Tatum-Herndon: Gently sloping to sloping, well drained, deep and moderately deep, silty soils that have a clayey subsoil formed in acid slate residuum on broad gentle slopes in Piedmont. This association is found on more than 25 percent of the study area.

Badin-Goldston-Wilkes: Hilly to very steep, well drained, shallow to moderately deep soils covering only 0.1 percent of area that have a slaty, loamy or clayey subsoil formed in acid slate and mixed acid and basic residuum.

Appling-Durham: Gently sloping to sloping, well drained, deep soils on 13.6 percent of study area that have a clayey or loamy subsoil formed in acid granitic residuum on broad smooth slopes near the fall line.

Wedowee-Louisburg: Gently sloping to steep, well drained, deep soils that have a clayey or loamy subsoil formed in acid granitic residuum. Occur in valleys, side slopes, and narrow ridges. Found on 16 percent of area.

Cecil-Madison-Appling: Gently sloping to sloping, well drained, deep soils that have a clayey subsoil formed in acid residuum on broad smooth uplands in the Piedmont, and covers 13 percent of area.

Wilkes: Hilly to steep, well drained, shallow soils that have a loamy subsoil formed in mixed acid and basic residuum on highly dissected narrow ridges and steep valleys in the Piedmont. Includes about 2 percent of study area.

Enon-Helena-Vance: Gently sloping to sloping, well drained and moderately well drained, moderately deep soils that have slowly permeable clayey subsoils formed in mixed and basic residuum on dissected uplands in the Piedmont. This association is found on 20.6 percent of the area.

Iredell-Mecklenburg-Enon: Smooth to sloping, moderately well drained to well drained, moderately deep soils that have slow to very slowly permeable clayey subsoils formed in basic residuum on broad smooth uplands in the Piedmont, covering 3.9 percent of the study area.

Geology

The northwestern one-third of the area consists mainly of metavolcanic slates, schists, and phyllites. The remainder is underlain primarily by granites and gneiss with lesser amounts of Triassic shales and sandstones.

Rocks of the Piedmont have been altered by various physical and chemical processes so that a moderately deep zone of reddish soil and soft decayed rock is characteristic of the region. The surface is rolling to hilly in many places, especially near the streams, but broad upland areas and long ridges are also common where the rocks are more resistent to erosion.

Land Use

Present land use in the Upper Tar Area includes cropland (20% - 54,933 acres), pasture and hayland (8% - 22,511 acres), forest land (66% - 184,313 acres), idle (2% - 4,613 acres), and other land (4% - 11,058 acres).

Population

Urban areas within the study area and their approximate 1980 populations are: Oxford (7,600), Louisburg (3,200), Franklinton (1,400), and Youngsville (500). Henderson (13,500) is situated on the study boundary and is only partially within the study area. The Upper Tar has a farm, forest, and agriculturally-related economy.

Forest Inventory

Forest covers 66% of the land area in the watershed. There are four forest types: pine (loblolly-shortleaf)--40%; pine-hardwood (pine-oak)--13%; upland hardwood (oak-Hickory)--35%; and bottomland hardwood--12%. The current inventory is about 263.1 million cubic feet of timber. This timber is classed as: sawtimber--37%; poletimber--38%; and seedling-sapling--25%. About 31.4 million board feet of sawlogs and 49,500 cords of pulpwood are harvested from 5,100 acres annually. Forty percent of the total amount harvested is hardwood.

CHAPTER II

PROBLEMS AND CONCERNS

Introduction

Problems and concerns of the Upper Tar River Study Area are related to the improvement in the quality of life through development, protection, enhancement, and utilization of the water and land-related resources. Changes in resource use and management are taking place within the area because of the demands placed upon the resources. The people of the State of North Carolina are concerned that the changes being made should be anticipated, considered, and brought about in an orderly manner. Concerns of the people have been expressed by members of various organizations, interested groups, and individuals and are as follows:

1. Preservation and protection of the resource base -- Severe erosion has caused a drastic decrease in crop yields. On some fields, the soil resource has been completely depleted.

2. Improvement of water quality -- Water quality degradation from sediment deposition is to the point where rough fish predominate in the rivers. Nutrient content derived from the Tar-Neuse drainage area has contributed to eutrophication in the lower Neuse River and Pamlico Bay.

3. Protection of the fishery resource -- Minimum in-stream flow requirements are needed to maintain a fishery resource. A sediment reduction is needed to benefit the fishery resource.

4. Identification and delineation of prime and important farmland and prime forest land, and 5. Identification and delineation of wetlands -- Site specific identification and delineation of these lands are needed to assist local planners and conservation districts in setting priorities for local projects and programs.

Erosion

Erosion is a complex, natural process that cannot be completely halted. It is more profoundly affected by man's activities than by natural processes. However, erosion can be controlled to within acceptable limits with sound land use and installation of conservation practices.

Gross erosion in the Upper Tar River Area amounts to about 783,153 tons annually. Cropland contributes almost 75 percent, or 584,860 tons to the annual erosion problem. Pasture and hayland, forest land, idle, other lands, and roads and streams contribute the remaining 25 percent, or 198,293 tons. Gross erosion by land use is presented in Table II-1 and Figure II-A.

Cropland erosion in the Upper Tar Basin contributes almost 600,000 tons annually to the erosion problem.

Severe sheet and rill erosion on the cropland in the background results in sediment damage to the pastureland in the foreground.

This critical cropland erosion has developed as a result of poor management. The gully now prevents use of the entire field.

Table II-1
Gross Erosion by Land Use, 1981
Upper Tar River Study Area, North Carolina

Land Use	Acres	Tons (Annually)	Tons/Ac./Yr. (Average)	Percent Total Erosion
Cropland	54,933	584,860	10.6	74.7
Pasture and Hayland	22,511	74,456	3.3	9.5
Forest Land[1/]	184,313	55,020	0.3	7.0
Other[2/]	15,230	59,852	3.9	7.6
Roadbanks	280	4,595	16.4	0.6
Streambanks	161	4,370	27.1	0.6
Total	277,428	783,153	--	100.0

1/ Includes 177,011 acres experiencing natural erosion at an estimated rate of 0.10 tons per acre per year.

2/ Includes idle land, farmsteads, urban areas, etc., and 450 acres of truck crops.

Gross erosion from about 80 percent of the land is less than 5 tons per acre per year (Table II-2). Nearly 23 percent of present soil loss originates from these lands considered to be adequately treated. Erosion rates greater than the 5 ton level exceed the soil loss tolerance for most soils. This level represents the maximum rate of soil erosion that will still permit a high level of crop production to be sustained economically over a long period of time. Most of the land in the 0-5 ton per acre per year erosion group is forest land. Toward the other end of the erosion continuum where erosion is 12 tons or more per acre per year, close to 8 percent of the land is associated with about 44 percent of present soil loss. Most of this land is in crop production.

Sheet, rill, and gully erosion on cropland accounts for almost 75 percent of the annual gross erosion. The average erosion rate on all cropland within the Basin is 10.4 tons per acre per year.

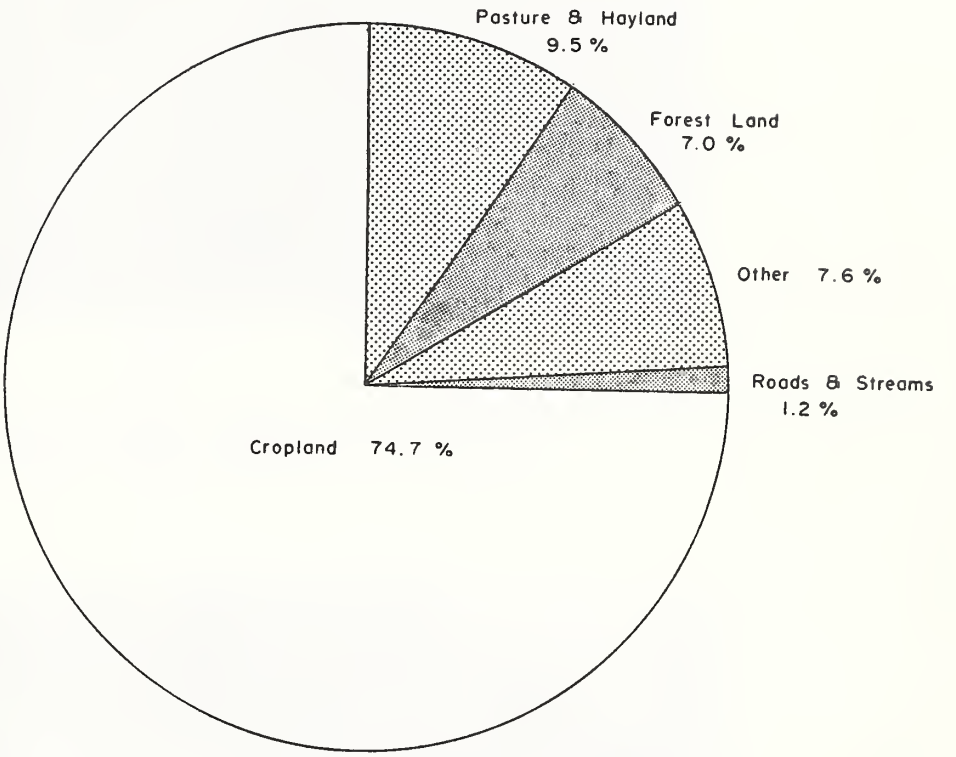
Installation and proper maintenance of recommended resource management systems will alleviate these erosion problems.

TABLE II-2
ACREAGE AND SOIL EROSION BY SOIL EROSION GROUPS, 1981
Upper Tar River Study Area, North Carolina

Existing Erosion Rate (t/ac./yr.)	Land Use 1/	Acres	Present Soil Loss (t/yr.)
0-5	Tobacco	1,116	3,438
	Corn	602	1,806
	Soybeans	1,203	3,609
	Small Grain	2,488	7,464
	Pastureland & Hayland	21,647	64,941
	Critical Area	-	-
	Other	197,891	95,434
	Total	224,977	176,692
	(Percent)	(81.1)	(22.6)
5-8	Tobacco	4,090	26,585
	Corn	1,149	7,469
	Soybeans	3,417	22,211
	Small Grain	4,360	28,340
	Pastureland & Hayland	230	1,495
	Critical Area	-	-
	Other	1,253	8,145
	Total	14,499	94,245
	(Percent)	(5.2)	(12.0)
8-12	Tobacco	7,022	70,220
	Corn	2,346	23,460
	Soybeans	4,305	43,050
	Small Grain	2,920	29,200
	Pastureland & Hayland	102	1,020
	Critical Area	-	-
	Other	257	2,570
	Total	16,952	169,520
	(Percent)	(6.1)	(21.7)
12-16	Tobacco	5,855	81,970
	Corn	1,700	23,800
	Soybeans	4,591	64,274
	Small Grain	944	13,216
	Pastureland & Hayland	500	7,000
	Critical Area	-	-
	Other	469	6,566
	Total	14,059	196,826
	(Percent)	(5.1)	(25.1)
16-20	Tobacco	2,454	44,172
	Corn	618	11,124
	Soybeans	1,729	31,122
	Small Grain	410	7,380
	Pastureland & Hayland	32	576
	Critical Area	-	-
	Other	22	396
	Total	5,265	94,770
	(Percent)	(1.9)	(12.1)
20	Tobacco	609	12,225
	Corn	266	6,650
	Soybeans	705	17,625
	Small Grain	4	100
	Pastureland & Hayland	-	-
	Critical Area	40	5,000
	Other	52	6,500
	Total	1,676	51,100
	(Percent)	(0.6)	(6.5)
	TOTAL	277,428	783,153
	(Percent)	(100.)	(100.0)

1/ Critical area includes roadbanks, streambanks, gullies, etc. Other includes forest land as well as idle, urban, farmsteads, etc., and less severely eroded road and streambanks.

Figure II-A
Percent Gross Erosion by Land Use, 1981
Upper Tar River Study Area, North Carolina



Cropland is the largest single contributor to the erosion and sedimentation problem in the area (Figure II-A). Major causes of cropland erosion are the lack of conservation systems on cropland and inadequate conservation practices on land suitable for crops. Of the 54,933 acres of cropland (excluding 450 acres of truck crops), approximately 10 percent, or 5,439 acres are considered adequately treated; i.e., eroding less than five tons per acre annually. The remaining 49,494 acres are eroding at rates greater than five tons per acre per year. The 49,494 acres eroding in excess of the soil loss tolerance contribute about 568,543 tons annually to gross erosion and are of major concern. Cropland erosion rates are presented in Table II-3.

Critical erosion occurs on 47 miles of roadsides in the Upper Tar Study Area.

Ten percent of the roadsides produce 40 percent of roadside erosion at a rate of more than 80 tons per acre per year.

Table II-3
Cropland Erosion Rates by Crops, 1981
Upper Tar River Study Area, North Carolina

Crop	Acres	Tons of Erosion (Annually)	Tons/Acre (Average)
Tobacco	21,176	241,610	11.4
Soybeans	15,950	181,891	11.4
Corn	6,681	74,309	11.1
Small Grain	11,126	85,700	7.7
Other Crops	450	1,350	3.0
Total	55,383	584,860	10.6

Erosion from 22,511 acres of pasture and hayland amounts to approximately 74,456 tons annually. Of this amount 10,091 tons are produced from about 864 acres eroding in excess of the soil loss tolerance for an average of 11.7 tons per acre per year. Excessive erosion on pasture and hayland results from overgrazing and/or improper fertilization on steeply sloping land.

Forest land erosion occurs mainly as a result of activities associated with timber harvest and reforestation operations. Most erosion problems occur during logging, windrowing, very heavy site preparation, and in connection with lack of maintenance on skid trails and log roads. Erosion caused by various silvicultural practices are shown in Table II-4.

As shown on Table II-1, erosion from other land (including urban and residential, farmsteads, land under development, etc.) is generally within the soil loss tolerance. Isolated areas, such as construction sites, mines and/or borrow pits usually have excessive erosion rates.

Roadside erosion occurs on 280 acres and totals 4,595 tons per year, while 161 acres of streambanks are eroding 4,370 tons annually (Table II-1). Ten percent of the roadsides is producing almost 40 percent of the erosion at a rate of 82 tons per acre per year. Nine percent of the streambanks is contributing 66 percent of the total at more than 200 tons per acre annually.

TABLE II-4
FOREST LAND EROSION[1/]
Upper Tar River Basin Study Area, North Carolina

Disturbance Factors	Acres	Tons (Annually)	Tons/Acre (Average)
Logging	4,896	6,463	1.32
Skid Trails	148	2,812	19.00
Log Roads	56	609	10.87
Roller Chopping	700	3,157	4.51
KG Blade	1,400	22,960	16.40
Fire	102	14	0.14
Total	7,302	36,015	4.93

1/ Natural erosion occurs on 177,011 acres of forest land at an estimated rate of 0.10 tons per acre per year producing an additional 19,005 annually.

Water Quality

The Division of Environmental Management (DEM), the water quality management agency for North Carolina, has expressed extreme concern over the deteriorating water quality of the northeastern coastal estuaries, including the Tar River system. These areas are experiencing the early stages of eutrophication. DEM studies have shown that nutrient inputs from the entire watershed are major contributors to this problem. The highly erosive croplands upstream of Louisburg are high contributors of nutrients. With the declining quality of our estuaries, a tremendously valuable resource for both recreational and commercial uses is being lost.

Forest land is a major contributor of high quality water yield in the area. Undisturbed forest land yields between 12-16 area inches annually. An additional area inch is contributed by sustained yield harvesting. This additional yield is significant during the spring and summer months as evapotranspirational losses are greatly reduced. This apparent yield, however, is not visible in the area owing to clogged channels.

The major portion of the Upper Tar River is being biologically degraded from sediment inputs. Almost 225,000 tons of sediment are being delivered annually to the stream systems of the Upper Tar River Basin. Of this amount, approximately 180,000 tons are transported by the Tar River to Louisburg. As a result of sedimentation, many of the small tributaries as well as the main stream of the Upper Tar River Basin are degraded.

Water quality is being deteriorated by stream-bank erosion which contributes up to 200 tons per acre per year.

Fishery Resource

A major concern is for the quality of acquatic ecosystems. Deposition of sediment in the streams, resulting from excessive erosion, has filled pool areas and disturbed the riffle-pool ratio. Sediment accumulation is to the point where rough fish predominate in most streams of the area. The recent sediments are unstable and cause shifting sand which is not conducive to supporting good game fish populations. Fish food organisms are almost nonexistent in the shifting sands found through the river system.

Sediment accumulation damages fishery resources and aesthetic values.

Land Use, Including Prime and Important Lands

Present land use is contributing to the problem of soil erosion and sedimentation in the study area. There is public concern for reducing soil erosion to help maintain productivity of the resource base for use by future generations. Land-use and management decisions are made individually. Consequently, decisions based on individual objectives are not necessarily consistent with public objectives. Individual landowners tend to be more concerned with present and near future conditions and make land-use decisions accordingly.

Sediment from severely eroding cropland has partially filled this small pond.

Some conversions in land-use are occurring. Conversion of land previously in woods or pasture to cropland without needed conservation treatment results in higher levels of soil erosion. Most newly converted lands will require land treatment in order to protect soil productivity. Conversion of agricultural land to non-agricultural uses tends to be irreversible. There is public concern when lands prime for agricultural uses are converted. These lands, however, are also prime for many non-agricultural uses. Again, public and private objectives often diverge. Landowners tend to choose the land-use that provides the highest economic return. The public generally prefers some orderly conversion where losses of prime lands for agricultural uses are minimized. Net reduction in investment can eventually lead to lower farm production and/or idling of farmland.

The number of farms and total land area in farms for the four county region including the study area have declined substantially during the 1964-78 period (Table II-5).1/ Even with these declines, cropland acreage has remained about the same. Reductions of land in farms have been offset by conversions of woodland to crop production. Average farm size has increased by about 40 percent during this period.

The four county share of land in farms in North Carolina has declined somewhat--5.5 percent in 1964 to 5.0 percent in 1978 (Table II-5). While the percentage share of total cropland is only slightly lower, the share of harvested cropland has decreased by a percentage point over 1964-78. The share of other cropland, primarily idled cropland and land on which crops failed, increased by 2.5 percentage points during this period. Based on these data, the four county area is gradually losing its percentage share of harvested cropland acreage in the state.

Nationally, as well as locally, there is concern about the amount of agriculturally productive land available to produce food and fiber. Map II-1 shows the general distribution of prime farmland within the study area. Prime farmland has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods. Excessive erosion is depleting the resource base of these important lands.

The supply and quality of the timber resource depends on the productiveness of the site. Forest cover must remain on the most productive sites for the 20 to 100 years needed to produce the desired forest products demanded in the future. If timber production is confined to poor sites with correspondingly poor soils capable of growing only trees of inferior quality at a slow rate, forest production will fall far below acceptable levels.

1/ Historical data for the Upper Tar portion of the four county area are not available.

Ownership of forest land was compared for the 1964 and 1974 period of Forest Survey Reports. In effect there has been a net increase of 4,004 acres (approximately one percent) in total forest land in the four-county study area. In approximating other shifts, much of the forest land gains and losses could be accounted for as follows:

1964. Miscellaneous federal land consisted of 23,238 acres. In 1974 it had decreased to 11,590 acres.

1964. State, county and municipal forest land was zero, but in 1974 it had increased to 10,661 acres.

Disposition of excess federal land is usually to other public ownership.

1964. Farmer-owned (494,861 acres) and miscellaneous corporate zero acres) increased 36,047 and 14,086 acres (50,133 acres total) respectively in 1974. This increase approximates the LOSS by private individual by 1974 of 53,771 acres.

Farmers now control over 530,908 acres (over 79 percent) of the commercial forest land (671,095 acres) in the four-county area, a gain of almost five percent since 1964.

1964. Forest industry owned 17,868 acres in 1964 and increased their holdings to 25,902 in 1974, a gain of 8,034 acres. This gain approximates the difference between farmer-owned and miscellaneous corporate lands (3,638 acres) plus 4,000 acres in reforestation and 392 acres of other land now in forest cover.

In the future there will continue to be shifts in farmer-owned and private individual ownerships as farmers increase their holdings for economic operations. Also, as cropland is depleted by erosion and over-cropping, a portion of the depleted land will be planted to trees. It is also expected that forest industry will continue to increase their holdings through purchase or exchange with farmer-owned and private individual ownerships. In the long run, no major shifts in commercial forest land acreage are anticipated. However, the conversion of forestland to crop production through the year 2020 would involve approximately 15,000 acres of prime forestland.

Wetlands

Wetlands found in the study area are basically associated with beaver ponds and are type 3[2]/ and 4[3]/ wetlands depending largely on the depth of the water and age of the pond. These wetlands are scattered throughout the area and provide good to excellent wetland wildlife habitat.

2/ Inland shallow fresh marsh (Circular 39, USFWS)

3/ Inland deep fresh marsh (Circular 39, USFWS)

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

BASE LEGEND

- INTERSTATE HIGHWAY
- U. S. HIGHWAY
- STATE HIGHWAY
- SECONDARY STATE HIGHWAY
- INTERSTATE ROAD
- PRIMARY ROAD
- SECONDARY ROAD
- TOWN
- DRAINAGE
- COUNTY BOUNDARY
- STUDY AREA BOUNDARY

LEGEND

- PRIME LAND
- IMPORTANT LAND
- OTHER LAND

VICINITY MAP

Map II-1

GENERAL PRIME AND IMPORTANT LANDS

UPPER TAR RIVER BASIN STUDY AREA

Portions of
FRANKLIN, ORANVILLE, PERSON,
AND VANCE COUNTIES
NORTH CAROLINA

Material prepared by Field Personnel.
Maps generated by North Carolina Department of Natural Resources and Community Development, Land Resources Information Service.

MARCH 1982 4-R-37790

USDA—SCS—FORT WORTH, TEXAS 1982

MARCH 1982 BASE 4-R-37788

Beaver ponds are largely unmanaged. Resource values associated with them are also unmanaged and species populations are dependent on seasonal variability of factors such as rainfall and temperature. The potential for managing these wetlands is excellent with such practices as water level manipulation, food plantings, duck box installation, and selective clearing having particular application.

Social and Economic Factors Affecting Resource Use[4/]

Several factors affect landowner's and/or manager's decisions for resource use which, in turn, affect the types and severity of problems with soil erosion and sediment delivery. Individuals must first be aware of a problem before taking any action. Awareness, however, is not sufficient. Individuals with short planning periods and needing immediate economic returns tend to be less interested in some forms of resource management, such as land treatment systems, which have immediate costs but may not provide economic returns until several years into the future. Also, those with short-term leases and/or leases that do not include provisions for landlord-tenant sharing of treatment costs would tend to be less interested in installing soil conservation practices. This latter group is more likely to be interested in extracting the most returns from the land while they operate it and with less concern for the effects on future soil productivity. In 1978, nearly 60 percent of all farmers in the four county area were involved in some type of rental arrangement; 45 percent were similarly involved in 1974.[5/] These farmers operated about three-fourths of the harvested cropland in 1978, two-thirds in 1974.

Individuals must be aware of erosion and sedimentation problems before making land use changes. About half of those participating in a survey of landowners and operators in the study area indicated having a problem with soil erosion. The majority recognized a problem on 25 or fewer acres.[6/] The proportion of full-time farmers indicating an erosion problem was higher than part-time farmers and those not doing any farming. Full-time farmers operate relatively more land resulting in more possibilities for erosion. They may also be more aware of the occurrence of erosion. The trend during the 1970's was toward more farmers spending more work days off the farm.

4/ Much of this section is based on results of a mail survey of landowners in the study area. This survey was conducted by the North Carolina Department of Natural Resources and Community Development. Also, interviews of landowners were conducted by SCS personnel.

5/ Bureau of the Census. 1978 Census of Agriculture. North Carolina.

6/ The survey format did not permit a comparison of respondent's indications of whether or not they had an erosion problem with SCS field determinations of problem areas.

Most of those participating in the survey were also involved in leasing land. Current leasing arrangements are not conducive to implementing land treatment practices. Only 30 percent of those surveyed had leases for a specific time period. These were short-term leases, usually for one year. However, over half rented to or from the same individual for five years or longer thereby providing some stability to leasing arrangements. Provisions for landlord-tenant sharing of the costs of installing conservation practices were included in less than 10 percent of the leases. Those renting relatively large tracts of land were no more likely to have a cost-sharing provision included in their leases than smaller-scale renters. There also was no correspondence between having a cost-sharing provision and length of the lease. When asked what changes in their lease would encourage them to install conservation practices, the need for longer lease--2 to 5 years--was mentioned most often. In addition, others felt owners should share more of the installation costs.

Even if individuals are aware of problems, have sufficiently long planning periods, and have tenure arrangements conducive to implementing land treatment practices, they must have the economic capability to underwrite costs of the practices. Cost sharing and technical assistance through USDA programs add to this economic capability of individuals. However, cost-sharing may not be adequate to induce voluntary conservation. Farms are relatively small in the four county area. In 1978, nearly 40 percent of the farms were less than 50 acres of size; three-fourths were less than 180 acres.7/ This size distribution was similar to that for 1974.

Partly related to farm size is the value of agricultural products produced. The percentage of farms with agricultural sales exceeding $20,000 per year has been increasing over the 1964-78 period (Table II-6). Yet, in 1978, about 40 percent of farms in the four county area had sales totaling less than $10,000. About half the farms had sales of that magnitude in 1974. Levels of sales must also be viewed in the context of time spent farming. In 1974 and 1978, about half of the farmers reported working off the farm. In 1978, about one-third indicated such work for over 150 days compared with 30 percent in 1974.8/

Capacity to pay for land improvements and implementation of conservation practices must be examined in the context of profits to farm enterprises, off-farm income, obligations for operating and living expenses, mortgage payments, and so on. This capacity will vary with farm operation and household and is not necessarily related to the incidence and severity of soil erosion problems. Even for those implementing practices, maintenance of the measures over time will be affected by this combination of social and economic factors.

7/ 1978 Census of Agriculture.

8/ 1978 Census of Agriculture.

Table II-6--Percentage of farms in ranges of value of agricultural sales for counties in the Upper Tar Study Area, 1964-78

	1964	1969	1974	1978
	----------Percent----------			
Upper Tar Basin 1/				
$40,000 and over	1.0	2.7	11.0	19.7
$20,000 - $39,999	4.1	6.6	13.9	17.7
$10,000 - $19,999	16.0	15.8	22.8	20.5
$5,000 - $9,999	31.2	25.2	20.8	16.5
$2,500 - $4,999	24.4	19.1	13.0	11.4
Less than $2,500	23.3	30.6	18.5	14.2

1/ Data for Franklin, Granville, Person, and Vance Counties
Sources: Bureau of the Census. Censuses of Agriculture.
Agricultural sales are in current dollars for each census year.

Among those in the survey with soil erosion problems, the most frequent reasons why action had not been taken was that installation was too costly or levels of cost-sharing for installation were too low. Also, they felt they had to use available monies for other farming and living expenses. Uncertainty of renting land from year to year and landowner-tenant reluctance to share installation costs were also often mentioned.

About two-thirds of those in the survey were familiar with farm conservation plans developed by SCS. Full-time farmers and those associated with larger acreages were relatively more familiar. Only 40 percent had plans for the land they owned and/or operated. Larger-scale operators had plans more often. Farm size, however, is not necessarily related to the occurrence of problems with erosion. Planning assistance provided by SCS conservationists results in the development of farm conservation plans which are instruments used for installing systems of conservation practices.

CHAPTER III

FORECASTING RESOURCE CONDITIONS

On-Site Effects of Erosion

Both short and long term adverse impacts occur when erosion and soil loss from land in agricultural production is greater than tolerance levels. Short term adverse effects are mainly production cost related. Production operations such as land smoothing and filling and shaping gullies prior to planting and in many cases again prior to harvesting increase costs. Other short-term effects include poor seed germination in subsoil, difficulty in cultivation, loss of crops from sediment deposition, and loss of fertilizer. Long-term effects are primarily related to the limited yield potential of soils below the productive layer. Continued excessive erosion will further deplete soil resources and will reduce the probability of long-term sustained production levels. Soils of the Upper Tar study area are particularly susceptible to damage because of slope, past erosion, and the lack of adequate conservation treatment and management measures.

Losses in crop production resulting from excessive cropland erosion are presented in Figures III-A, III-B, III-C, and III-D.

Potential tobacco yields (Figure III-A) are estimated to be reduced 11 percent for each 225 tons per acre or 1.5 inches of soil loss.[9/][10/]

Acres eroding less than five tons per acre per year are excluded from projections. Five tons per acre per year is considered within acceptable limits to maintain high productivity for an indefinite period of time. Present gross erosion on 20,030 acres is 238,172 tons per year. Therefore, 1,058 equivalent acres are now experiencing an 11 percent reduction in yield annually (238,172 ÷ 225 = 1,058).

Corn yields are reduced by almost 16 percent (Figure III-B) for each 225 tons per acre soil loss.[10/][11/] With the present gross erosion rate of 72,503 tons annually from corn land, about 322 equivalent acres are experiencing a 15.6 percent yield reduction. By the year 2000, cumulative acres with reduced yields will amount to about 6,100, and by 2020, to more than 12,500 acres.

9/ Adams, Williams E., 1949, Loss of Topsoil - Reduced Crop Yield. J. Soil and Waters. 4(3):130.

10/ Our Soils and Their Management, Roy L. Donahue, Interstate Publishers, Danville, Illinois, page 341. 1970.

11/ Soil Conservation, J. H. Stallings, Prentice-Hall, Inc., 1957, pages 207-217.

Figure III-A

UPPER TAR RIVER STUDY AREA

TOBACCO ACREAGE LOSING 11% PRODUCTION POTENTIAL DUE TO EROSION

(PROJECTED FROM EXISTING CONDITIONS)

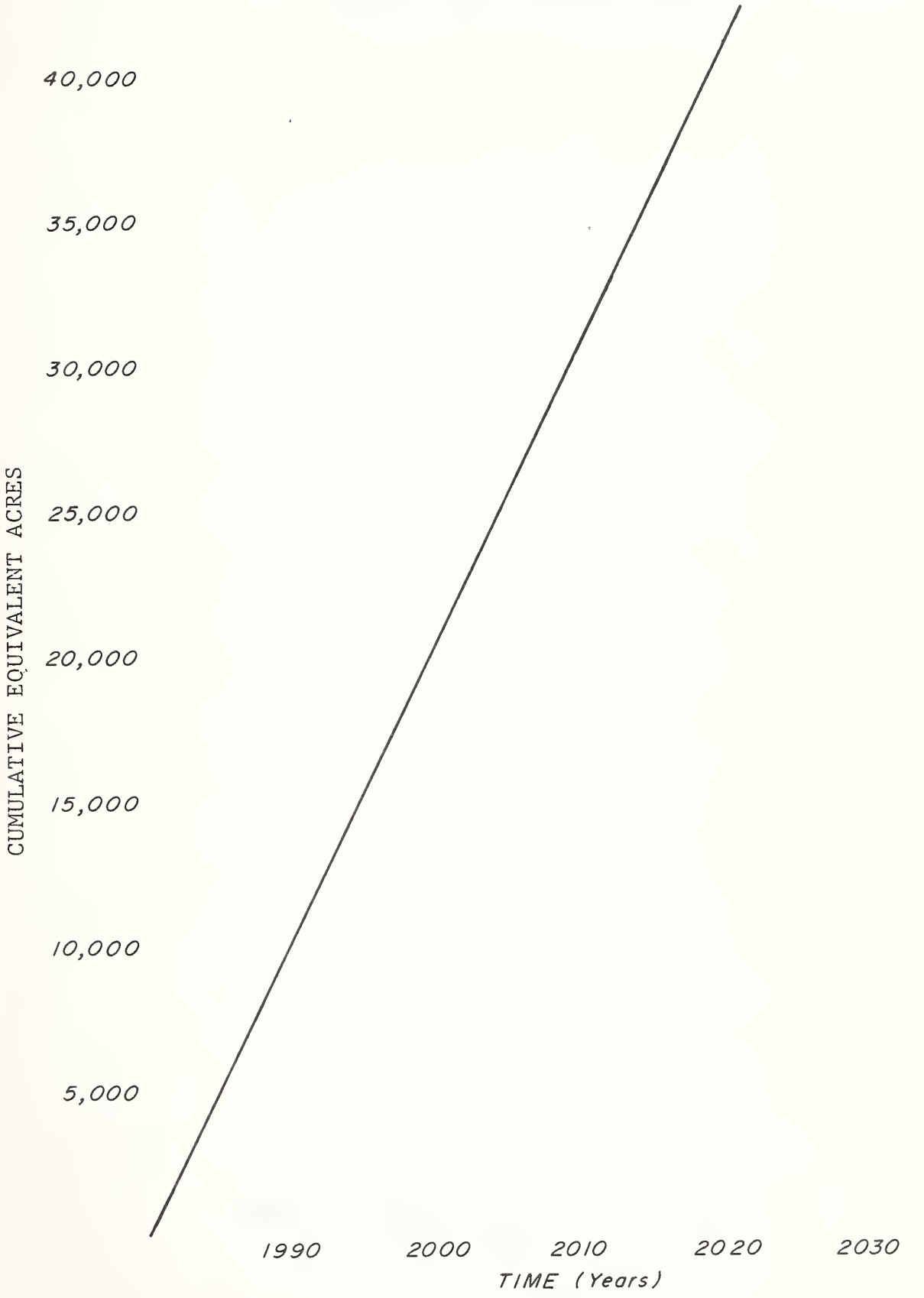


Figure III-B

UPPER TAR RIVER STUDY AREA

CORN ACREAGE LOSING 15.6% PRODUCTION POTENTIAL DUE TO EROSION

(PROJECTED FROM EXISTING CONDITIONS)

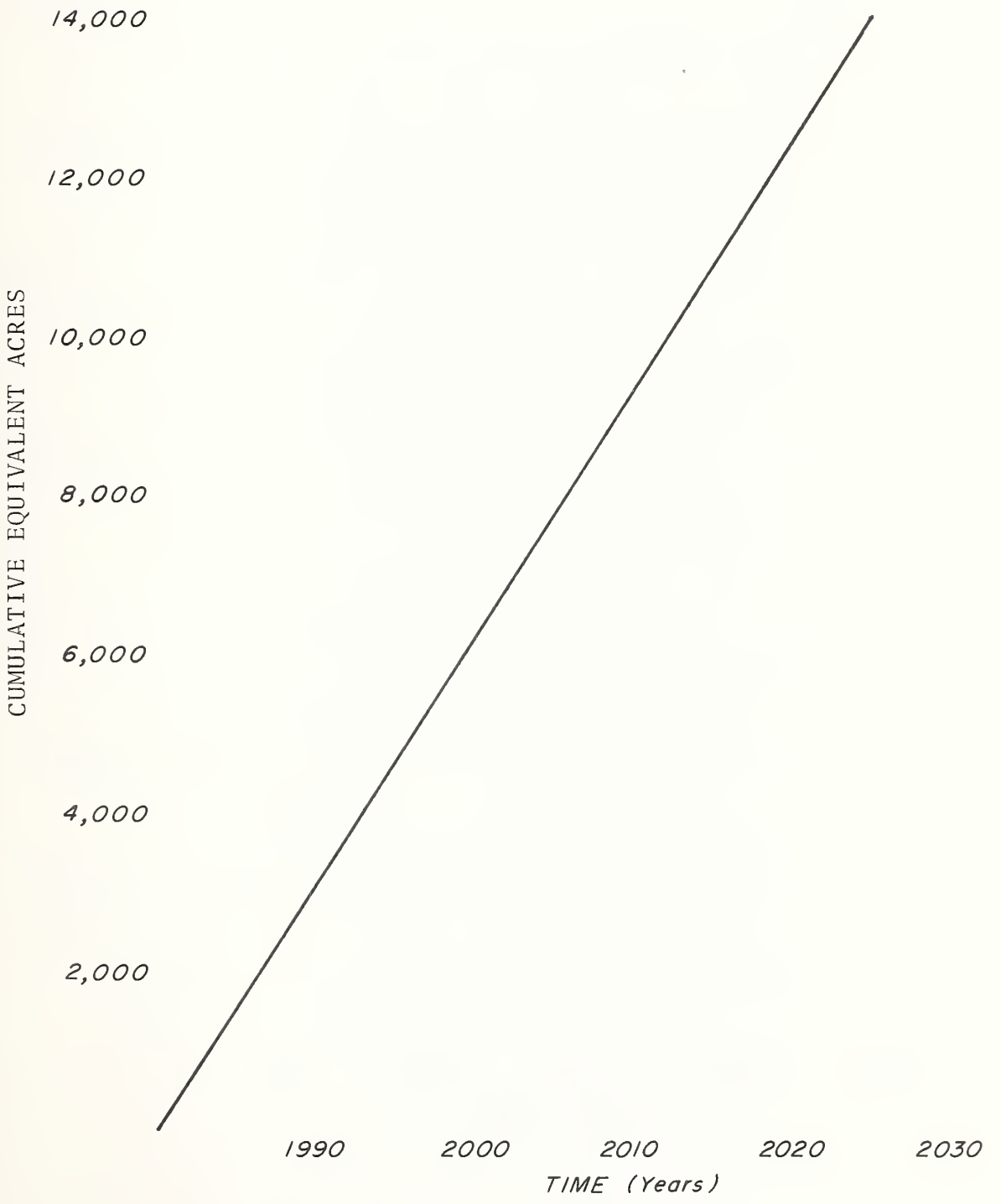


Figure III-C

UPPER TAR RIVER STUDY AREA

SOYBEAN ACREAGE LOSING 22% PRODUCTION POTENTIAL

DUE TO EROSION (PROJECTED FROM EXISTING CONDITIONS)

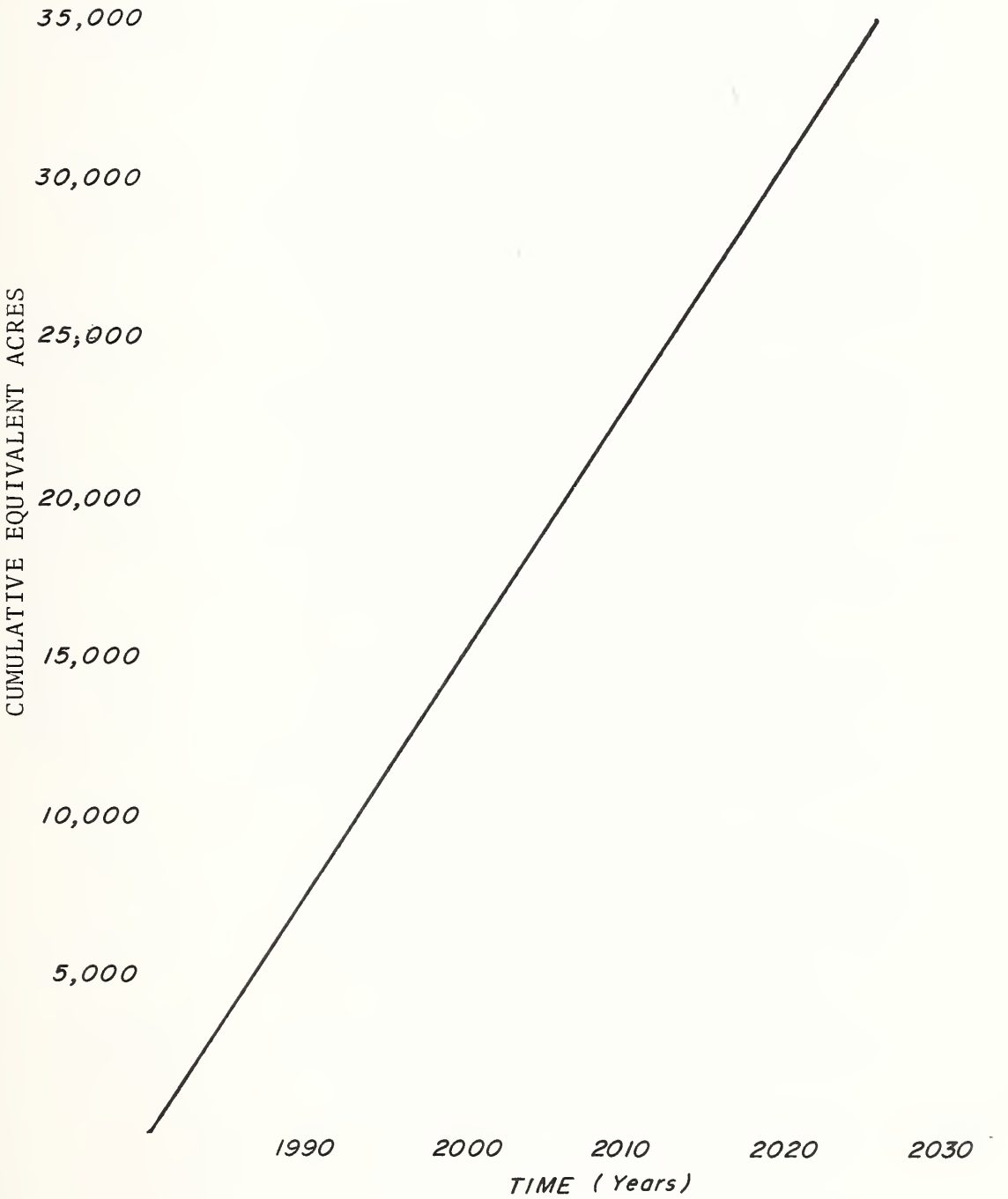
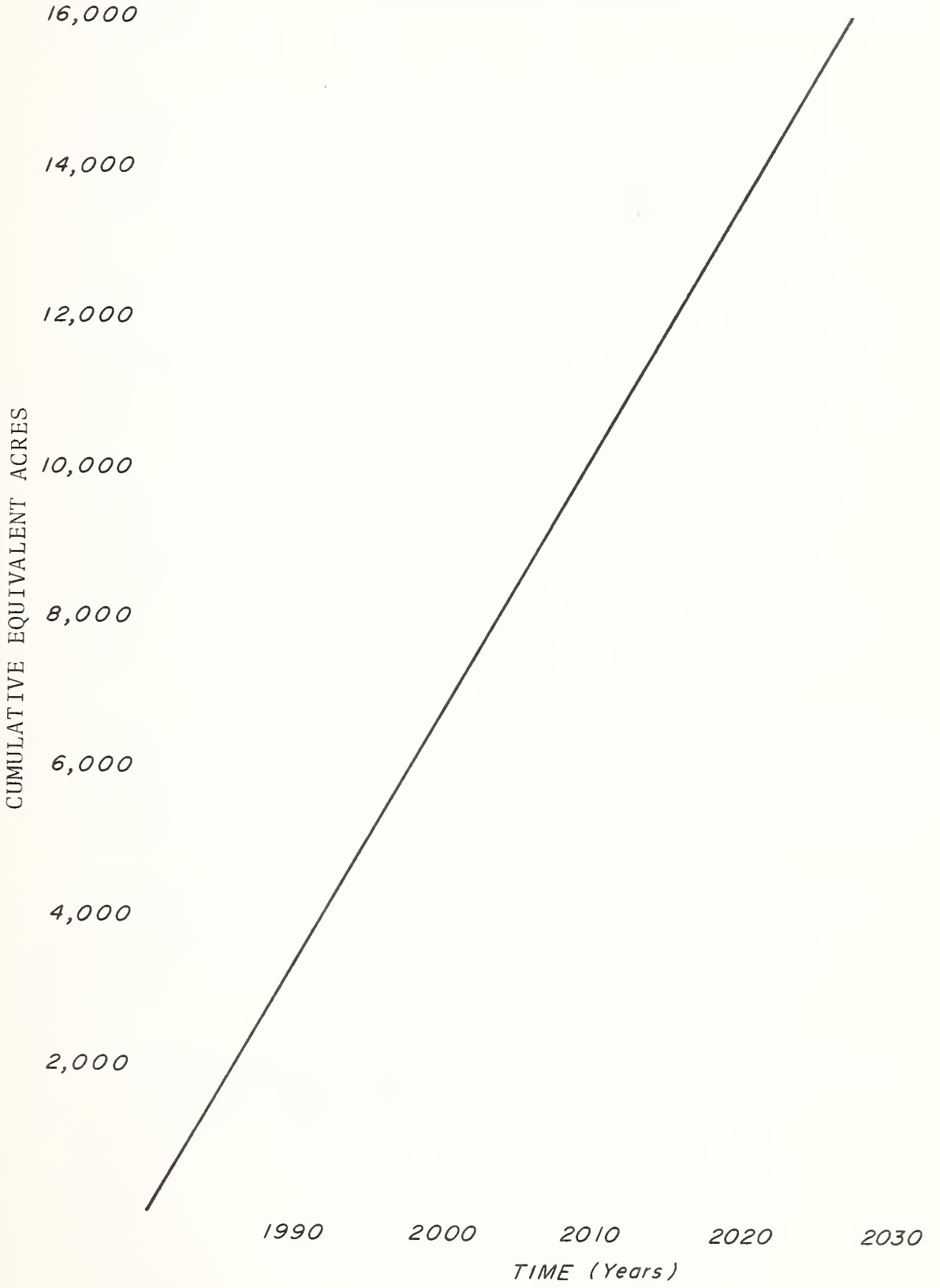


Figure III-D

UPPER TAR RIVER STUDY AREA

SMALL GRAIN ACREAGE LOSING 10.5% PRODUCTION POTENTIAL DUE TO EROSION

(PROJECTED FROM EXISTING CONDITIONS)



Soybean production losses (Figure III-C) amount to about 22 percent per acre[12/] due to an average erosion rate of 11.4 tons per acre per year. Because of this excessive erosion, there are currently about 800 equivalent acres on which soybeans are producing less than potential. In 20 years, at this rate, the reduced yields will have occurred on more than 16,000 acres.

There is a 10.5 percent loss of small grain production potential (Figure III-D) due solely to erosion.[11/] Present gross erosion amounts to 78,236 tons annually (excluding 7,464 tons from 2,488 acres considered adequately treated). The loss of production now occurs on about 300 equivalent acres and by the year 2020 will have occurred on more than 13,500 acres if present erosion rates are allowed to continue.

For each 225 tons of soil loss per acre, present crop yields are expected to be reduced over the time period during which the erosion occurs as follows: Tobacco--11 percent; Corn--15.6 percent; Soybeans--22 percent; and Small Grain--10.5 percent. If, for example, erosion from cropland is 15 tons/acre/year over time, accumulated soil loss after 15 years would total 225 tons. Over this 15 year period, tobacco yields would decrease by 11 percent, corn by 15.6 percent, etc.

The relationship between levels of soil erosion and reductions in yields is summarized in Table III-1. The overall planning period is 1980-2020. As an example, the yield reduction for tobacco due to erosion in the 8-12 tons/acre/year soil loss group, with 10 tons/acres/year as the midpoint is derived as follows: 225 tons ÷ 10 tons/acre/year = 22.5 years; 40 year planning period ÷ 22.5 years = 1.78 x 11 percent yield reduction = 19.6% yield reduction for the planning period. With present levels of input use and management, soil productivity will be impaired on all lands eroding in excess of 5 tons/acre/year.

For tobacco, corn, and small grain, the cited articles (9/, 10/, 11/) represent a documentation of the relationship between erosion and reduced productivity. The 22 percent decrease in soybean production was established as a result of a concensus of SCS personnel from the State Resource Conservationist's Office, the Water Resources Planning Staff, and review and analysis of research from other sources.

There appears to be no significant adverse affects from forestry and silvicultural applications. Technical assistance in volunteer application of best management practices in forestry will reduce present on-site disturbance and resultant erosion and sediment delivery.

12/ Journal of Soil and Water Conservation, Volume 35, No. 3, page 133. "Predicting the Effects of Soil Depletion from Erosion." Rosenberry, Knutson, and Harmon.

TABLE III-1
CROP YIELD REDUCTION RESULTING FROM SOIL EROSION FOR UNTREATED CONDITIONS
(WITHOUT TECHNOLOGICAL IMPROVEMENTS), 1980-2020

Upper Tar River Study Area, North Carolina

Erosion Group (t/ac./yr.)	Tobacco		Corn		Soybeans		Small Grain	
	Acres	% Reduction	Acres	% Reduction	Acres	Reduction (bu./ac.)	Acres	% Reduction
5-8	4,090	12.8	1,149	18.1	3,417	4.6	4,360	12.2
8-12	7,022	19.6	2,346	27.8	4,305	7.1	2,920	18.7
12-16	5,855	27.3	1,700	38.7	4,591	9.9	944	26.0
16-20	2,454	35.2	618	49.9	1,729	12.8	410	33.6
> 20	609	58.7[1/]	266	82.7[1/]	705	21.2[1/]	--	--

1/ Based on 30 t/ac./yr.

Off-Site Effects of Erosion

Excessive erosion from land preparation for agricultural production, from lands inadequately treated, from timber harvesting operations, from urban development, and from other land disturbances is the source of sediment that degrades water quality and fills ponds, stream channels, wetlands, and road ditches. Sediment accumulation in portions of the Upper Tar

One-quarter of a million tons of sediment reach the streams of the Upper Tar River system annually.

River amounts to greater than 20 feet in thickness. This occurs as a result of the estimated 225,000 tons of sediment delivered to the stream systems of the Basin annually. Should erosion and sediment yield continue at present rates, by the year 2020, nine million tons of sediment will have been deposited in the streams, of which about 7.2 million tons

will have been transported by the Upper Tar River to the study area outlet at Louisburg.

Excessive erosion associated with agricultural activities contributes the greatest volume of sediment and suspended-solid loads to the streams. As the excessive erosion continues in the uplands, the downstream water quality continues to decline. Other potential agriculturally related pollution sources are pesticides and nutrients from cropland. Suspended solids, in the form of sediment and the turbidity it causes, are directly related to the erosion problem. Other pollutants, such as pesticides and herbicides, are frequently attached to soil particles, which in turn are transported with the soil to the stream.

With the ever-increasing sediment deposition, the esthetic values of the Upper Tar River and tributaries will continue to be degraded.

A further decline in the quality of the fishery resource can be expected in the future. Sediment adversely effects fish populations by destroying habitat, spawning beds, eggs, and larval fish. Under severe conditions, such as found in portions of the Upper Tar River, even adult fish are adversely affected. Sediment transported along stream bottoms as bedload also decreases fish populations by destroying bottom-dwelling organisms used by fish for food. The sand bedload produces little food for fish because of its instability and constantly shifting condition. In addition, aquatic habitats have been practically eliminated in some reaches of the channels by sediment while other reaches will continue to decline as increased sedimentation occurs.

Land Use

Land use will be affected by several factors. The most important factor affecting future use of agricultural land is the economic returns to using land in agriculture relative to returns from other uses. Population in the study area is projected to increase by about 20 percent during the 1980-2020 period.13/ With a per person land requirement of .75 acres, an estimated 12,900 acres of land would need to be converted to nonagricultural uses. Much of this is expected to come from land currently in farms. Higher prices for land remaining in agriculture are likely to affect decisions for land use and investment in agriculture. Uncertainty fueled by land speculation may cause some disinvestment and idling of land. If "normalized" price relationships for the 1975-79 period are assumed to hold for the future,14/ land-use patterns over the planning period should reflect those of the late 1970's.

13/ See the "Social and Economic" section.

14/ "Normalized" prices are discussed in the "Social and Economic section.

Government programs are important. The tobacco allotment program is assumed to continue. With on-going soil erosion control programs, some land currently in production may be idled or shifted to permanent vegetation as reduced soil productivity lowers the profitability of using the land for crop production. Conversions to forest land would add to the capability for production of wood products as well as reduce levels of soil erosion on these lands. However, depending on the severity of the impaired eroded land, forest production would be at a reduced rate and a longer rotation period. With accelerated erosion control programs, relatively more land currently in crop production should remain in that use. Changes in export markets, tax laws, and resource-use legislation are additional factors affecting future land use.

Projections for major uses of land in farms in the four county area were based on trends over the past 15-year period (Table III-2).[15/] Land in farms is projected to continue a downward trend primarily due to conversions of farmland to nonagricultural uses. Cropland acreage has remained relatively stable over the past 15 years. With accelerated land treatment programs, a modest increase in cropland acreage to 250,000 acres is projected for 2020. Within the total cropland category and with accelerated land treatment, reductions in other cropland, including idle cropland, are projected to contribute to a sizeable expansion in harvested cropland acreage by the year 2020. This projected increase is about 25 percent above the 1978 level. If accelerated land treatment programs are not implemented, acreage of other cropland will increase and harvested cropland acreage will decrease.

The projected reductions of farm lands are offset by projected conversions of woodland to crop production (Table III-2). These conversions permit the projected increase in the cropland base over the 1990-2020 period. The decline of woodland in farms is only 8 percent below the 1978 level. Woodland in farms includes woodland not actually under cultivation provided it was part of a farm operator's total farm operation. Large acreages held for non-agricultural purposes are not included.

Historical trends for harvested acreage of major crops were also projected to year 2020 (Table III-3). Relatively more weight was given to acreage harvested during 1975-79--the period for which the most recent "normalized" prices apply. With the exception of soybeans, cropping patterns are projected to be relatively invariant over time. Conversions of woodland to cropland to support the projected increase in soybean acreage will result in higher levels of soil erosion and the potential need for additional land treatment systems. Tobacco acreage is projected to decline somewhat. After subtracting acres in small grains, most of which will be double cropped, harvested acres of major crops are generally achievable within the projections of total cropland harvested if land treatment programs are accelerated.

15/ These trends were shown in Table II-5 in the "Land-Use" section of the Concerns and Problems chapter.

Table III-2. Projections of major uses of land in farms for counties in the Upper Tar River Study Area, 1990-2020 1/

Major Uses	1978 2/	1990	2000	2020
Land in farms (1,000 ac.)	568.0	560.0	555.0	540.0
Total cropland (1,000 ac.)	235.1	240.0 3/	245.0 3/	250.0 3/
Harvested cropland (1,000 ac.)	131.1	140.0	145.0	165.0
Cropland for pasture (1,000 ac.)	46.3	45.0	50.0	50.0
Other cropland (1,000 ac.) 4/	57.7	55.0	50.0	35.0
Woodland, including woodland pasture (1,000 ac.)	264.6	260.0	255.0	245.0
Other Land (1,000 ac.) 5/	68.2	60.0	55.0	45.0

1/ Franklin, Granville, Person, and Vance Counties.

2/ 1978 Census of Agriculture.

3/ With accelerated land treatment programs.

4/ Land in soil improvement crops, land on which all crops failed, and idle cropland.

5/ Pastureland and rangeland other than cropland pasture and woodland pasture plus land in farmsteads, ponds, roads, and wasteland.

Future land use will affect levels of crop production, value of agricultural production, and levels of soil erosion. The alternative land treatment systems analyzed in the next chapter will directly impact the levels of soil erosion and future productivity of the resource base as well as the landowner and public costs associated with implementing these treatment systems.

Social and Economic

With a small study area, there are few bases for making projections. Trends in secondary data provide some indications. Contacts with landowners and(or) managers generate some information and insights into current conditions.

Table III-3. Projections of harvested acreage and production of major crops for the four county area, 1990-2020 1/2/

Major Crops		1975-79	1990	2000	2020
All corn	(1,000 acres)	41.18	41.5	42.0	43.0
	(bu/acre)	45.0	60.0	66.0	75.0
	(mil. bu.)	1.88	2.5	2.8	3.2
Soybeans	(1,000 acres)	39.7	44.0	50.5	64.5
	(bu/acre)	18.0	24.0	27.0	31.0
	(mil. bu.)	0.71	1.1	1.4	2.0
Tobacco	(1,000 acres)	38.1	35.0	34.5	34.0
	(lb/acre)	1770	1850	1960	2100
	(mil. lbs.)	67.4	64.7	67.6	71.4
Wheat	(1,000 acres)	18.3	19.2	19.8	20.7
	(bu/acre)	28	33	35	40
	(mil. bu.)	0.51	0.63	0.69	0.83
Barley	(1,000 acres)	3.2	3.3	3.45	3.75
	(bu/acre)	45	48	52	60
	(mil. bu.)	0.14	0.16	0.18	0.22
Oats	(1,000 acres)	3.6	3.8	4.05	4.35
	(bu/acre)	48	60	65	70
	(mil. bu.)	0.17	0.23	0.26	0.30
Rye	(1,000 acres)	0.1	0.2	0.2	0.2
	(bu/acre)	20	23	24	25
	(mil. bu.)	0.002	0.005	0.005	0.005
All hay	(1,000 acres)	13.2	13.5	14.0	15.0
	(tons/acre)	1.4	1.5	1.6	1.7
	(1,000 tons)	18.5	20.2	22.4	25.5
Total acres		158.0	160.5	168.5	185.5

1/ Area includes Franklin, Granville, Person, and Vance Counties.

2/ All projected increases based solely on trends in technological advances including erosion control practices.

Population in the study area increased by nearly 11 percent during the 1970-80 period. Population is projected to increase by about 17,200 during 1980-2020--a 23 percent increase over the 1980 level.[16/] Some conversion of land to nonagricultural uses will occur. The increase in population will require additional educational, health, and utility services. Property taxes, including those on agricultural land, will likely increase. An increase in consumers should strengthen the local economy.

If the 1975-79 "normalized" price relationships are representative of future relationships, returns to farming should not change substantially unless technological breakthroughs are developed. Future directions of government programs are uncertain.

Several factors interacting to affect decisions concerning implementation of conservation practices have been identified. Differences in public and private perceptions of soil erosion being a problem, who should pay for corrective measures, and to whom benefits should be addressed. Public impetus can be in the form of accelerated informational programs and higher levels of cost sharing. The most important factor is the profitability of farming which affects the means for installing practices and the economic returns on practices.

16/ Preliminary projections of populations at the county and state levels have been developed by the North Carolina Department of Natural Resources and Community Development. The county level projects are disaggregated into study area shares based on the 1960-80 trend in the proportion of county population within the study area.

CHAPTER IV

ALTERNATIVES

Introduction

An evaluation of the problems and concerns has resulted in the recognition of erosion and associated sedimentation as the most critical problem. The prominence of prime and important lands is recognized, however, detailed soils information necessary for the identification and delineation of these lands is not available. Type 3 and 4 wetlands, basically associated with beaver ponds, are the only wetlands identified in the area. Therefore, only the problems associated with erosion and sedimentation will be addressed in the alternatives.

About 75 percent of the identified erosion problem occurs on cropland. Control of cropland erosion is the key to maintaining long-term productivity of the soil resource. Therefore, resource management systems for cropland erosion control have been analyzed and grouped according to the significance of erosion reduction when applied to a specific crop experiencing a particular erosion rate.

Three alternative plans for reducing erosion and sedimentation have been developed: (1) Continuation of the on-going program; (2) Continuation of the on-going program plus adequately treat all acres eroding greater than 12 tons per acre per year; and (3) Adequately treat all lands (see Tables IV-1, IV-2, and IV-3). On these tables, critical area includes forest land as well as idle, urban, farmsteads, etc., and less severely eroded roads and streambanks.

The recommended resource management systems (Tables IV-4 and IV-5) are effective and implementable in the study area. Each system is cost-effective based on field office technical guides. Such factors as farm size, type of equipment, economics, crops grown, management capability, and others, affect the selection of systems for installation.

Costs of the systems were determined by examining costs of current construction in each district of the four-county area. A weighted average cost for each system has been used in deriving total costs for the alternatives.

Alternative No. 1 - Continuation of the on-going program

Under this alternative, all resources would remain essentially in their present condition or continue to change as currently changing. Installation of conservation measures will continue at the present rate of application.

Currently, gross erosion amounts to more than 783,000 tons annually. Without an accelerated program, erosion would be reduced by only about 45,000 tons, or six percent, during the next ten years (Table IV-1). Sediment delivered to the area outlet at Louisburg would actually increase by about two percent from 180,000 to 184,000 tons annually due to further deterioration of those lands on which erosion is approaching the critical stage.

Presently, there are 52,451 acres in the study area eroding greater than five tons per acre per year. With a continuation of the on-going program to year 1990, erosion on approximately 45,000 of the acres would continue to exceed five tons per acre per year. The average erosion rate would be even higher than the present 11.5 tons per acre per year.

Alternative No. 2 - Adequately treat all lands eroding greater than 12 tons per acre per year

The objective of this alternative is to reduce erosion (and resulting sedimentation) over a ten-year treatment period on all lands eroding in excess of 12 tons per acre per year (see Table IV-2). Erosion rates were calculated by applying the Universal Soil Loss Equation to current cropping patterns (1981) as displayed on Map IV-1. With this alternative, approximately 25,250 acres will be adequately treated including about 7,100 acres under the on-going program. Land to be treated by various resource management systems is presented in Table IV-4. The most significant systems recommended for installation include crop rotations and conservation tillage in conjunction with terraces and/or diversions, grassed waterways and field borders. All systems listed will be used, but to a lesser degree.

In addition to cropland, approximately 40 acres of critically eroding roadbanks and streambanks, and about 52 acres of other critically eroded areas would be stabilized. This stabilization will require slope shaping, seeding or sprigging, mulching and fertilization, and in some particularly severe locations rip-rap may be necessary.

Gross erosion would be reduced by about 32 percent, or from 783,000 tons annually to about 532,800 tons. Sediment yield would be reduced to about 122,500 tons annually from the present 180,000 tons. Of the 52,451 acres requiring treatment to reduce erosion to an acceptable level, approximately 27,000 would still lack adequate treatment.

Alternative No. 3 - Adequately treat all lands

Under this alternative, erosion on all lands would be reduced to within five tons per acre per year during a ten-year treatment period (see Table IV-3). Resource management systems recommended for installation in this alternative are shown in Table IV-5.

Gross erosion would be reduced by approximately 342,000 tons (44 percent) while a reduction in sediment yield would amount to about 46 percent, i.e., from 180,000 tons annually to about 97,000 tons.

Table IV-1
UPPER TAR RIVER STUDY AREA
ALTERNATIVE NO. 1
CONTINUATION OF ON-GOING PROGRAM (10-YEAR TREATMENT PERIOD)

Existing Erosion Rate (t/ac./yr.)	Land Use	Acres	Technical Assistance Available On-Going Program 1/ (Man-Years)	Land Treated On-Going Program (Acres)	Land Needing Treatment Accelerated Program (Acres)	Technical Assistance Needed Accelerated Program (Man-Years)	Present Soil Loss (t/yr.)	Soil Loss Reduction to 5 t./ ac./yr. (t/yr)	Construction Cost 2/ (Dollars)	Technical Assistance Costs 3/ Planning (Dollars)	Technical Assistance Costs 3/ Application (Dollars)	Total Cost (Dollars)	Remaining Land Needing Treatment (Acres)
0-5	Tobacco	1,146	-	-	-	-	1,418	-	-	-	-	-	0
	Corn	602	-	-	-	-	1,806	-	-	-	-	-	0
	Soybeans	1,203	-	-	-	-	3,609	-	-	-	-	-	0
	Small Grain	2,488	-	-	-	-	7,464	-	-	-	-	-	0
	Past. & Hay.	21,647	-	-	-	-	64,941	-	-	-	-	-	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	197,891	-	-	-	-	95,434	-	-	-	-	-	0
5-8	Tobacco	4,090	1.56	554	-	-	26,585	831	55,400	12,675	38,025	106,100	3,536
	Corn	1,149	0.44	155	-	-	7,469	233	15,500	3,575	10,725	29,800	994
	Soybeans	3,417	1.30	462	-	-	22,211	693	46,200	10,562	31,688	88,450	2,955
	Small Grain	4,360	1.66	590	-	-	28,340	885	59,000	13,487	40,463	112,950	3,770
	Past. & Hay.	230	0.09	32	-	-	1,495	48	1,920	731	2,194	4,845	198
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	-
	Other	1,253	0.48	170	-	-	8,145	255	25,500	3,900	11,700	41,100	1,083
8-12	Tobacco	7,022	2.68	951	-	-	70,220	4,755	118,875	21,775	65,325	205,975	6,071
	Corn	2,346	0.89	318	-	-	23,460	1,590	39,750	7,231	21,694	68,675	2,028
	Soybeans	4,305	1.64	583	-	-	43,050	2,915	72,875	13,325	39,975	126,175	3,722
	Small Grain	2,920	1.11	395	-	-	29,200	1,975	49,375	9,018	27,057	85,450	2,525
	Past. & Hay.	102	0.04	14	-	-	1,020	70	1,120	325	975	2,420	88
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	-
	Other	257	0.10	35	-	-	2,570	175	5,250	812	2,438	8,500	222
12-16	Tobacco	5,855	2.23	793	-	-	81,970	7,137	138,775	18,118	54,357	211,250	5,062
	Corn	1,700	0.65	230	-	-	23,800	2,070	40,250	5,281	15,844	61,375	1,470
	Soybeans	4,591	1.75	621	-	-	64,274	5,589	108,675	14,218	42,657	165,550	3,970
	Small Grain	944	0.36	128	-	-	13,216	1,152	22,400	2,925	8,775	34,100	816
	Past. & Hay.	500	0.19	68	-	-	7,000	612	6,800	1,543	4,632	12,975	432
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	-
	Other	469	0.18	63	-	-	6,566	567	22,050	1,462	4,388	27,900	406
16-20	Tobacco	2,454	0.93	332	-	-	44,172	4,316	66,400	7,556	22,669	96,625	2,122
	Corn	618	0.23	84	-	-	11,124	1,092	16,800	1,868	5,607	24,275	534
	Soybeans	1,729	0.66	234	-	-	31,122	3,042	46,800	5,362	16,088	68,250	1,495
	Small Grain	410	0.16	55	-	-	7,380	715	11,000	1,300	3,900	16,200	355
	Past. & Hay.	32	0.01	4	-	-	576	52	700	81	244	1,025	28
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	-
	Other	22	0.01	4	-	-	396	52	1,400	81	244	1,725	18
> 20	Tobacco	609	0.23	82	-	-	15,225	1,640	16,400	1,868	5,607	23,875	527
	Corn	266	0.10	36	-	-	6,650	720	7,200	81	244	7,525	230
	Soybeans	705	0.27	95	-	-	17,625	1,900	19,000	2,193	6,582	27,775	610
	Small Grain	4	-	-	-	-	100	-	-	-	-	-	4
	Past. & Hay.	-	-	-	-	-	-	-	-	-	-	-	-
	Critical Area	40	0.01	5	-	-	5,000	500	6,000	81	244	6,325	35
	Other	52	0.02	7	-	-	6,500	700	8,400	162	488	9,050	45
	TOTAL	277,428 4/	20.00	7,100	-	-	783,153	46,281	1,029,815	161,596	484,829	1,676,240	45,351

1/ The on-going program allocates two (2.0) man-years per year to the basin area.

2/ Average cost of applying needed conservation treatment based on 100 percent sample; Price 1981.

3/ Cost per man-year for technical assistance, including planning and application and benefits and administration, is $32,500. Twenty-five percent of the technical assistance cost is for planning and seventy-five percent is for application.

4/ 52,451 acres eroding greater than 5 t/ac./yr.

Table IV-2
UPPER TAR RIVER STUDY AREA
ALTERNATIVE NO. 2 (10-YEAR TREATMENT PERIOD)
ADEQUATELY TREAT ALL AREAS ERODING GREATER THAN 12 TONS PER ACRE PER YEAR

Existing Erosion Rate (t/ac./yr.)	Land Use	Acres	Technical Assistance Available On-Going Program 1/ (Man-Years)	Land Treated On-Going Program (Acres)	Land Needing Treatment Accelerated Program (Acres)	Technical Assistance Needed Accelerated Program (Man-Years)	Present Soil Loss (t/yr.)	Soil Loss Reduction to 5 t./ ac./yr. (t/yr)	Construction Cost 2/ (Dollars)	Technical Assistance Costs 3/ Planning (Dollars)	Technical Assistance Costs 3/ Application (Dollars)	Total Cost (Dollars)	Remaining Land Needing Treatment (Acres)
0-5	Tobacco	1,146	-	-	-	-	3,438	-	-	-	-	-	0
	Corn	602	-	-	-	-	1,806	-	-	-	-	-	0
	Soybeans	1,203	-	-	-	-	3,609	-	-	-	-	-	0
	Small Grain	2,488	-	-	-	-	7,464	-	-	-	-	-	0
	Past. & Hay.	21,647	-	-	-	-	64,941	-	-	-	-	-	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	197,891	-	-	-	-	95,434	-	-	-	-	-	0
5-8	Tobacco	4,090	1.56	554	-	-	26,585	831	55,400	9,438	28,314	93,152	3,536
	Corn	1,149	0.44	155	-	-	7,469	233	15,500	2,662	7,986	26,148	994
	Soybeans	3,417	1.30	462	-	-	22,211	693	46,200	7,865	23,595	77,660	2,955
	Small Grain	4,360	1.66	590	-	-	28,340	885	59,000	10,043	30,129	99,172	3,770
	Past. & Hay.	230	0.09	32	-	-	1,495	48	1,920	544	1,632	4,096	198
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	1,253	0.48	170	-	-	8,145	255	25,500	2,904	8,712	37,116	1,083
8-12	Tobacco	7,022	2.68	951	-	-	70,220	4,755	118,875	16,214	48,642	183,731	6,071
	Corn	2,346	0.89	318	-	-	23,460	1,590	39,750	5,384	16,152	61,286	2,028
	Soybeans	4,305	1.64	583	-	-	43,050	2,915	72,875	9,922	29,766	112,563	3,722
	Small Grain	2,920	1.11	395	-	-	29,200	1,975	49,375	6,715	20,145	76,235	2,525
	Past. & Hay.	102	0.04	14	-	-	1,020	70	1,120	242	726	2,088	88
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	257	0.10	35	-	-	2,570	175	5,250	605	1,815	7,670	222
12-16	Tobacco	5,855	2.23	793	5,062	14.26	81,970	52,695	1,024,625	99,764	299,292	1,423,681	0
	Corn	1,700	0.65	230	1,470	4.14	23,800	15,300	297,500	28,979	86,937	413,416	0
	Soybeans	4,591	1.75	621	3,970	11.18	64,274	41,319	803,425	78,226	234,678	1,116,329	0
	Small Grain	944	0.36	128	816	2.30	13,216	8,496	165,200	16,093	48,279	229,572	0
	Past. & Hay.	500	0.19	68	432	1.27	7,000	4,500	50,000	8,833	26,499	85,332	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	469	0.18	63	406	1.14	6,566	4,221	164,150	7,986	23,958	196,094	0
16-20	Tobacco	2,454	0.93	332	2,122	5.98	44,172	31,902	490,800	41,805	125,415	658,020	0
	Corn	618	0.23	84	534	1.50	11,124	8,034	123,600	10,466	31,398	165,464	0
	Soybeans	1,729	0.66	234	1,495	4.21	31,122	22,477	345,800	29,463	88,389	463,652	0
	Small Grain	410	0.16	55	355	1.00	7,380	5,330	82,000	7,018	21,054	110,072	0
	Past. & Hay	32	0.01	4	28	0.08	576	416	5,600	544	1,632	7,776	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	22	0.01	4	18	0.05	396	338	7,700	363	1,089	9,152	0
> 20	Tobacco	609	0.23	82	527	1.48	15,225	12,180	121,800	10,345	31,035	163,180	0
	Corn	266	0.10	36	230	0.65	6,650	5,320	53,200	4,537	13,611	71,348	0
	Soybeans	705	0.27	95	610	1.72	17,625	14,100	141,000	12,039	36,117	189,156	0
	Small Grain	4	-	-	4	0.01	100	80	800	60	180	1,040	0
	Past. & Hay.	-	-	-	-	-	-	-	-	-	-	-	0
	Critical Area	40	0.01	5	35	0.10	1,000	4,000	48,000	665	1,995	50,660	0
	Other	52	0.02	7	45	0.13	6,500	5,200	52,000	907	2,721	55,628	0
	TOTAL	277,428 4/	20.00	7,100	18,159	51.2	783,153	250,333	4,478,365	430,631	1,291,893	6,190,489	27,192

1/ The on-going program allocates two (2.0) man-years per year to the basin area.

2/ Average cost of applying needed conservation treatment based on 100 percent sample; Price 1981.

3/ Cost per man-year for technical assistance, including planning and application and benefits and administration, is $24,200
Twenty-five percent of the technical assistance cost is for planning and seventy-five percent is for application.

4/ 52,451 acres eroding greater than 5 t/ac./yr.

Table IV-3
UPPER TAR RIVER STUDY AREA
ALTERNATIVE NO. 3
ADEQUATELY TREAT ALL LANDS (10-YEAR TREATMENT PERIOD)

Existing Erosion Rate (t/ac./yr.)	Land Use	Acres	Technical Assistance Available On-Going Program 1/ (Man-Years)	Land Treated On-Going Program (Acres)	Land Needing Treatment Accelerated Program (Acres)	Technical Assistance Needed Accelerated Program (Man-Years)	Present Soil Loss (t/yr.)	Soil Loss Reduction to 5 t./ac./yr. (t/yr.)	Construction Cost 2/ (Dollars)	Technical Assistance Costs 3/ Planning (Dollars)	Technical Assistance Costs 3/ Application (Dollars)	Total Cost (Dollars)	Remaining Land Needing Treatment (Acres)
0-5	Tobacco	1,146	-	-	-	-	3,438	-	-	-	-	-	0
	Corn	602	-	-	-	-	1,806	-	-	-	-	-	0
	Soybeans	1,203	-	-	-	-	3,609	-	-	-	-	-	0
	Small Grain	2,488	-	-	-	-	7,464	-	-	-	-	-	0
	Past. & Hay.	21,647	-	-	-	-	64,941	-	-	-	-	-	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	197,891	-	-	-	-	95,434	-	-	-	-	-	0
5-8	Tobacco	4,090	1.56	554	3,536	9.96	26,585	6,135	409,000	69,696	209,088	687,784	0
	Corn	1,149	0.44	155	994	2.80	7,469	1,723	114,900	19,602	58,806	193,308	0
	Soybeans	3,417	1.30	462	2,955	8.32	22,211	5,125	341,700	58,201	174,603	574,504	0
	Small Grain	4,360	1.66	590	3,770	10.62	28,340	6,540	436,000	74,294	222,882	733,176	0
	Past. & Hay.	230	0.09	32	198	0.56	1,495	345	13,800	3,932	11,796	29,528	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	1,253	0.48	170	1,083	3.05	8,145	1,880	187,950	21,356	64,068	273,374	0
8-12	Tobacco	7,022	2.68	951	6,071	17.10	70,220	35,110	877,750	119,669	359,007	1,356,426	0
	Corn	2,346	0.89	318	2,028	5.71	23,460	11,730	293,250	39,930	119,790	452,970	0
	Soybeans	4,305	1.64	583	3,722	10.48	43,050	21,525	538,125	73,326	219,978	831,429	0
	Small Grain	2,920	1.11	395	2,525	7.11	29,200	14,600	365,000	49,731	149,193	563,924	0
	Past. & Hay	102	0.04	14	88	0.25	1,020	510	8,160	1,754	5,262	15,176	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	257	0.10	35	222	0.62	2,570	1,285	38,550	4,356	13,068	55,974	-
12-16	Tobacco	5,855	2.23	793	5,062	14.26	81,970	52,695	1,024,625	99,764	299,292	1,423,681	0
	Corn	1,700	0.65	230	1,470	4.14	23,800	15,300	297,500	28,979	86,937	413,416	0
	Soybeans	4,591	1.75	621	3,970	11.18	64,274	41,319	803,425	78,226	234,678	1,116,329	0
	Small Grain	944	0.36	128	816	2.30	13,216	8,496	165,200	16,093	48,279	229,572	0
	Past. & Hay.	500	0.19	68	432	1.27	7,000	4,500	50,000	8,833	26,499	85,332	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	469	0.18	63	406	1.14	6,566	4,221	164,150	7,986	23,958	196,094	0
16-20	Tobacco	2,454	0.93	332	2,122	5.98	44,172	31,902	490,800	41,805	125,415	658,020	0
	Corn	618	0.23	84	534	1.50	11,124	8,034	123,600	10,466	31,398	165,464	0
	Soybeans	1,729	0.66	234	1,495	4.21	31,122	22,477	345,800	29,463	88,389	463,652	0
	Small Grain	410	0.16	55	355	1.00	7,380	5,330	82,000	7,018	21,054	110,072	0
	Past. & Hay.	32	0.01	4	28	0.08	576	416	5,600	544	1,632	7,776	0
	Critical Area	-	-	-	-	-	-	-	-	-	-	-	0
	Other	22	0.01	4	18	0.05	396	338	7,700	363	1,089	9,152	0
> 20	Tobacco	609	0.23	82	527	1.48	15,225	12,180	121,800	10,345	31,035	163,180	0
	Corn	266	0.10	36	230	0.65	6,650	5,320	53,200	4,537	13,611	71,348	0
	Soybeans	705	0.27	95	610	1.72	17,625	14,100	141,000	12,039	36,117	189,156	0
	Small Grain	4	-	-	4	0.01	100	80	800	60	180	1,040	0
	Past. & Hay.	-	-	-	-	-	-	-	-	-	-	-	0
	Critical Area	40	0.01	5	35	0.10	5,000	4,000	48,000	665	1,995	50,660	0
	Other	52	0.02	7	45	0.13	6,500	5,200	52,000	907	2,721	55,628	0
	TOTAL	277,428 4/	20.00	7,100	45,351	127.78	783,153	342,416	7,601,385	893,940	2,681,820	11,177,145	0

1/ The on-going program allocates two (2.0) man-years per year to the basin area.

2/ Average cost of applying needed conservation treatment based on 100 percent sample; Price 1981.

3/ Cost per man-year for technical assistance, including planning and application and benefits and administration, is $24,200. Twenty-five percent of the technical assistance cost is for planning and seventy-five percent is for application.

4/ 52,451 acres eroding greater than 5 t/ac./yr.

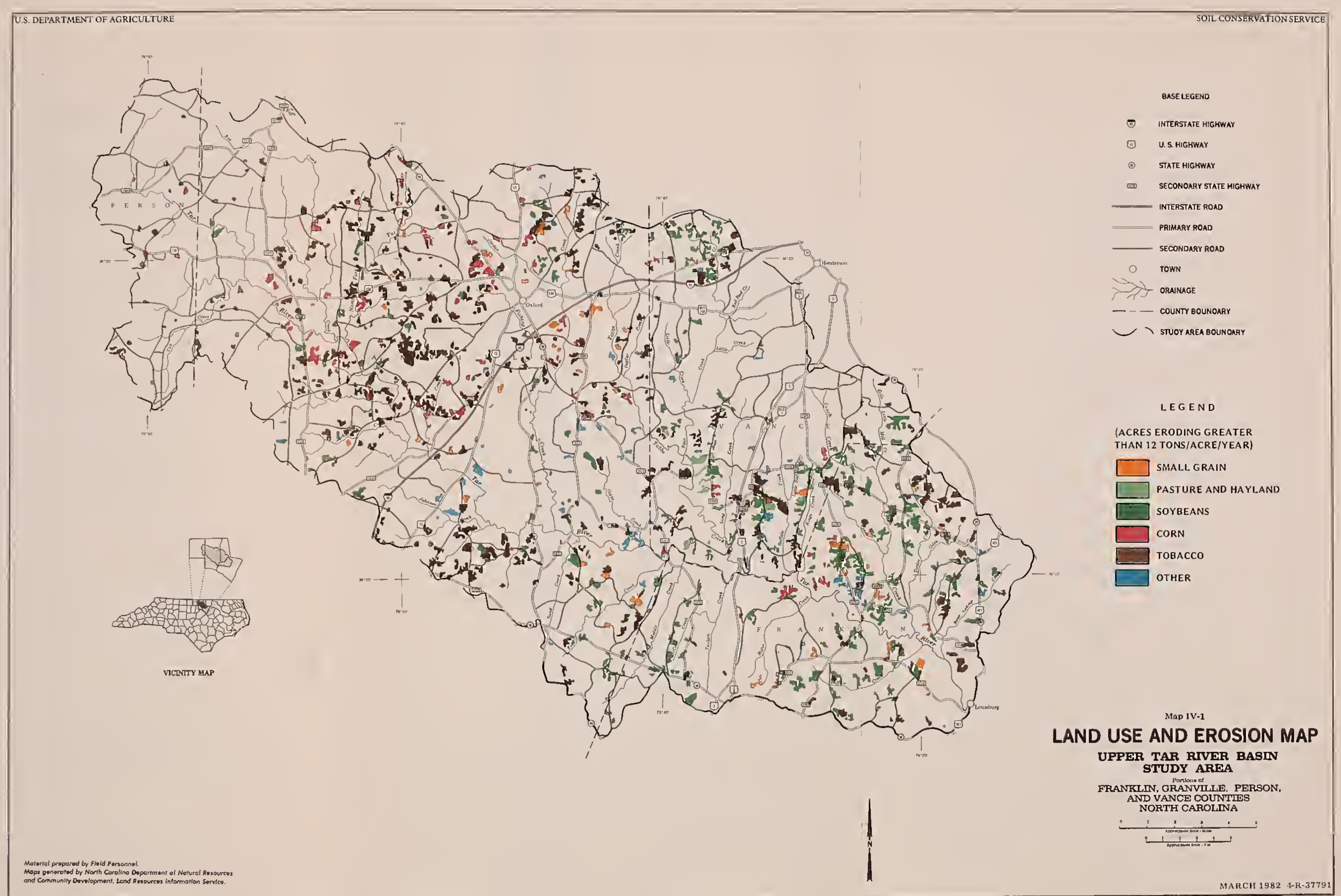


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Table IV-4
UPPER TAR RIVER STUDY AREA
RECOMMENDED RESOURCE MANAGEMENT SYSTEMS TO BE APPLIED
ALTERNATIVE NO. 2

Resource Management System	Tobacco (Acres)	Corn (Acres)	Soybeans (Acres)	Small Grain (Acres)	Installation Cost/Acre (Dollars)
Crop Residue Use	129	--1/	--	72	5
Crop Rotations (Crop Residue Use Included)	1,133	181	248	319	20
Terraces or Diversions (Includes Contouring)	--	--	--	--	64
Stripcropping with Terraces or Diversions	--	--	80	--	69
Stripcropping with Field Borders & Grassed Waterways (GW)	--	--	--	--	125
Stripcropping with Terraces or Diversions, Field Borders and Grassed Waterways	--	--	--	--	189
Conservation Tillage	180	1,001	2,201	186	10
Conservation Tillage and Grassed Waterway	--	--	321	--	100
Crop Rotations (CR) and Contour Farming	--	--	--	--	20
CR and Terraces and Diversions (TD)	159	--	--	--	143
CR, TD, and Grassed Waterways	849	--	158	--	169
CR, TD, GW, & Field Borders	5,123	481	448	374	199
CR, TD, & Field Borders	886	--	95	--	109
CR & GW	92	--	60	--	105
TD & GW & Field Borders	--	--	--	--	184
TD & Field Borders	--	--	--	--	94
Contour Farming & Field Borders	--	--	133	--	30
Conservation Tillage with Diversions & Grassed Waterways	--	754	2,763	222	164
CR & Contour Farming	--	--	--	--	15
Needs Converting to other Uses	--	--	330	54	150
Critical Area Treatment	182	--	--	--	1,200
Other Systems	186	167	188	131	--
TOTAL	8,918	2,584	7,025	1,358	--

1/ Dash represents less than 50 acres. Total included in Other Systems category.

Table IV-5
UPPER TAR RIVER STUDY AREA
RECOMMENDED RESOURCE MANAGEMENT SYSTEMS TO BE APPLIED
ALTERNATIVE NO. 3

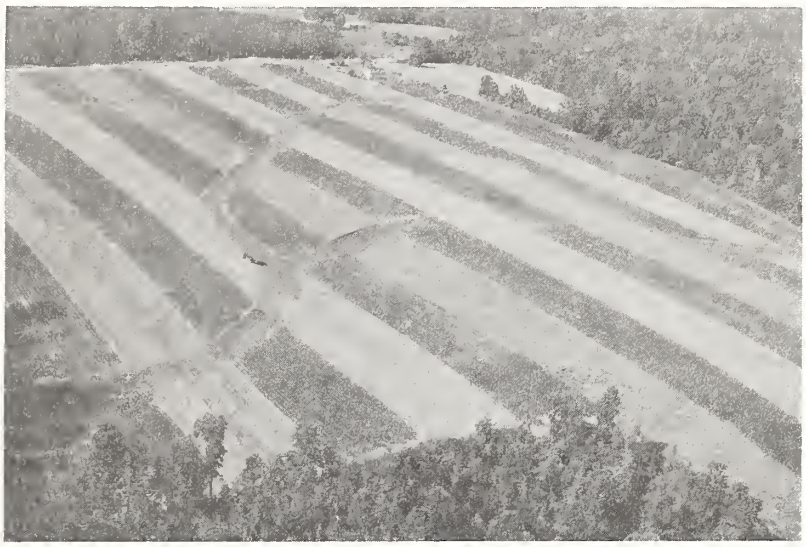
Resource Management System	Tobacco (Acres)	Corn (Acres)	Soybeans (Acres)	Small Grain (Acres)	Installation Cost/Acre (Dollars)
Conservation Tillage with Diversions & Grassed Waterways	--1/	920	5,821	1,085	164
Cropland Conversion (Crop to Grass)	--	--	--	--	175
Crop Residue Use	313	--	51	488	5
Crop Rotations (Crop Residue Use Included)	2,854	474	562	1,874	20
Contour Farming	200	--	--	96	20
Terraces or Diversions (Includes Contouring)	--	--	--	--	64
Grassed Waterways (GW)	126	--	147	--	90
Field Borders or Filter Strips	--	--	--	--	30
Stripcropping (Contour or (Field)	--	--	--	--	5
Stripcropping with Terraces or Diversions	--	--	181	--	69
Stripcropping with Field Borders & Grassed Waterways	--	--	69	--	125
Stripcropping with Terraces or Diversions, Field Borders & Grassed Waterways	--	--	53	--	189
Conservation Tillage	438	2,494	3,970	795	10
Conservation Tillage & GW	--	--	729	123	100
Crop Rotation (CR) & Contour Farming	106	--	--	--	20
CR & Terraces & Diversions (TD)	385	--	--	89	143
CR, TD, & Grassed Waterways	1,478	--	357	220	169
CR, TD, GW, & Field Borders	11,173	1,233	1,017	2,342	199
CR, TD, & Field Borders	1,396	69	215	295	109
CR & GW	223	57	137	--	105
CR & Field Borders	97	--	--	80	45
Cover Crop	--	--	--	--	20
TD & GW & Field Borders	92	--	--	--	184
TD & Field Borders	148	--	82	--	94
Contour Farming and Field Borders	75	--	303	161	30
Critical Area Treatment	--	--	56	--	1,200
Contour Farming & GW	--	--	--	--	90
Needs Reestablishment	252	84	58	350	150
Needs Converting to Other Uses	441	510	750	430	185
Other Systems	233	238	189	210	--
Total	20,030	6,079	14,747	8,638	--

1/ Dash represents less than 50 acres. Total included in Other Systems category.

Effects of Alternatives

Erosion

Only a six percent reduction in gross erosion would be realized under Alternative No. 1. Because of the streamlining effect of transport mechanisms (further deterioration of waterways, road ditches, etc.), sediment yield will probably increase. Under Alternative No. 2, gross erosion would be reduced by about 250,000 tons (32%) and sediment yield



Land treatment measures, strip cropping and grassed waterways reduce soil erosion.

by almost 58,000 tons. Installation of recommended conservation systems in Alternative No. 3 would result in an erosion and sediment yield reduction of about 342,000 tons (44%) and 83,000 tons (46%), respectively.

Soil productivity will be extended on all acres treated. Effects of alternatives on erosion rates and crop yields are shown in Table IV-6.

Table IV-6

UPPER TAR RIVER STUDY AREA

EFFECTS OF ALTERNATIVES ON EROSION RATES AND CROP YIELDS, 1982-2020

Crop	Acres Adequately Treated				Average Erosion Rate (t/ac./yr.)				Average Yields Per Acre[2/] [3/]			
	Pres.	Alt. 1[1/]	Alt. 2[1/]	Alt. 3[1/]	Pres.	Alt. 1[1/]	Alt. 2[1/]	Alt. 3[1/]	Pres.	Alt. 1[4/]	Alt. 2[4/]	Alt. 3[4/]
Tobacco	1,146	3,858	11,569	21,176	11.4	10.2	7.9	5.0	1,770 (lbs)	1,809 (lbs)	1,885 (lbs)	1,980 (lbs)
Corn	602	1,425	3,659	6,681	11.1	9.8	7.8	5.0	45 (bu)	47 (bu)	49 (bu)	53 (bu)
Soybeans	1,203	3,198	9,273	15,950	11.4	10.1	7.7	5.0	18 (bu)	19 (bu)	21 (bu)	22 (bu)
Small Grain	2,488	3,656	4,831	11,126	7.7	6.8	6.5	5.0	33 (bu)	34 (bu)	34 (bu)	35 (bu)

1/ At end of 10-year treatment period.

2/ Excluding future technological improvements.

3/ Based on a given percent increase for each 225 tons of soil saved (see p. 30).

4/ By year 2020.

Water Quality

The installation of recommended resource management systems in any of the three alternatives to control erosion will similarly enhance the water quality of the Tar River stream system by reducing downstream sedimentation.

A reduction in high sediment levels will improve the streams' physical and biological character. Sunlight transmission and photosynthesis processes will be increased. Fish spawning beds will be maintained as clogged channels are cleansed, and organisms vital to the food chain will increase. In addition, lower sediment levels will decrease water use treatment costs.

Sediment also transports some pesticides, nutrients, and other potential pollutants that are adsorbed on the soil particles. Under certain conditions these adsorbed materials may be released into the water with the potential to adversely affect water quality. A reduction in sediment delivery to the streams will reduce the nutrient loads. This will have a positive impact upon the downstream waters which are nutrient-sensitive at this time.

Additionally, the esthetic values of streams with clean water can be enhanced and appreciated by those who use the waters for leisure and recreational purposes.

Fishery Resource

The fishery resource in the basin would be significantly improved by any land treatment program that would effectively reduce sediment delivered to the river and its tributaries. The beneficial effect would occur within the Upper Tar area and also to the Lower Tar River fishery resource.

A literature review indicates that little is known about the direct effect of sediment reduction on stream fisheries populations and/or eventual fish harvest. A general conclusion that can be drawn, however, is that both bedload and suspended sediment are harmful to the stream food chain and fish spawning activities. These two factors will largely determine the productivity of any given water body. Recovery rate for Piedmont streams is variable. Several surveys have indicated that if sediment delivery is curtailed, recovery will occur. However, the recovery rate based on degree of curtailment cannot be determined or declared cost-effective at this time. Experts in the biological arena are quick to point out that upstream areas or feeder streams are important sources of recolonization for benthic invertebrates and also are important for spawning of game fish. In addition, suspended sediment in a stream can also significantly affect the use of streams by the fishermen. This reduced utilization equals fewer fishermen days, and consequently, adverse economic effects.

Wildlife Resource

A land treatment program utilizing plans for erosion control that also have wildlife food and/or cover value should significantly improve the wildlife habitat values in the area. This effect will be most important to small game species such as quail or rabbits. Improved edge conditions through field border development and critical area stabilization will contribute to better small grain habitat.

Comparison of Alternatives

All three alternatives are aimed at reducing erosion on 52,451 acres of land, including 49,494 acres of cropland, experiencing excessive erosion. A reduction in sediment yield and downstream sedimentation will result in improvements in water quality and fishery resources. Ten-year treatment periods are suggested in each alternative. Benefits of land treatment for each alternative are included in succeeding alternatives, i.e., resource management systems recommended in Alternatives 1 and 2 are included as part of the totals in Alternatives 2 and 3, respectively.

Alternative No. 1 would result in 7,100 acres being adequately treated. Twenty man-years would be required to install the recommended systems at a cost of about 1.68 million dollars. This amounts to an estimated cost of $236 per treated acre. Following the ten-year treatment period, 45,351 acres would remain inadequately treated. Though erosion would be reduced by six percent, sediment yield will increase by two percent.

Under Alternative No. 2, recommended resource management systems would be installed on 25,259 acres including 7,100 acres treated under the on-going program. However, there would be 27,192 acres remaining inadequately treated. About 71 man-years would be necessary to plan and install the needed systems. Twenty of these man-years are accounted for in the on-going program. Total cost of this alternative is about 6.2 million dollars, or an estimated $245 per treated acre. Erosion and sediment yield would be reduced by about 32 percent.

All lands would be adequately treated during the ten-year treatment period under Alternative No. 3. Total cost of the alternative would be 11.2 million dollars, or about $213 per treated acre. Erosion would be reduced by 44 percent and sediment yield reduction by 46 percent.

A summary comparison, including acres needing treatment, remaining needs, costs, and effects is presented in Table IV-7.

Table IV-7
UPPER TAR RIVER STUDY AREA
COMPARISON OF ALTERNATIVES
(10-YEAR TREATMENT PERIOD)

	Comparison Item	Alternative No. 1	Alternative No. 2	Alternative No. 3
1.	Land Needing Treatment (Acres)	52,451	52,451	52,451
2.	Land Treated (Acres)	7,100	25,259	52,451
3.	Remaining Land Needing Treatment (Acres)	45,351	27,192	0
4.	Cropland acres on which a potential yield increase is anticipated due to a reduction in soil erosion 1/			
	a. Tobacco	2,712	10,423	20,030
	b. Corn	823	3,057	6,079
	c. Soybeans	1,995	8,070	14,747
	d. Small Grain	1,168	2,343	8,638
5.	Technical Assist. needed (Man-Years)	20	71.2	147.8
6.	Cost-Technical Asst. (Dollars) 2/	646,425	1,722,524	3,575,760
7.	Cost-Construction of Resource Management Systems (Dollars)	1,029,815	4,467,965	7,601,385
8.	Total Cost	1,676,240	6,190,489	11,177,145
9.	Erosion Reduction (Tons/Year)	46,281	250,333	342,416
10.	Sediment Reduction (Tons/Year)	+4,093	57,575	83,163

1/ From Tables IV-1, IV-2, and IV-3.

2/ Includes dollars for planning and application.

CHAPTER V

IMPLEMENTATION STRATEGIES

Introduction

Numerous strategies for protection of the land resources can be developed once the problems are defined and some degree of effect can be measured as a request of certain actions. A major benefit from this special erosion study would be for the reader to grasp the scope and nature of the problem and to formulate new and better strategies to solve these problems.

There are existing authorities and programs that are used traditionally to solve land and water resource problems. To fully develop and utilize the soil resources, application of land treatment is currently needed on 49,494 acres of cropland and 2,957 other acres. These 52,451 acres represent 19 percent of the study area. The remaining 81 percent is considered adequately treated.

A discussion of the existing strategies follows:

Land Treatment

Conservation land treatment is a basic element in formulating a watershed protection program. It is defined as applying management, cultural, and structural practices in such a manner that the land is used within the limits of its capabilities and soil losses from erosion are held to acceptable levels. Land treatment is accomplished primarily through the development and implementation of conservation plans.

Conservation plans on individual units of land are documents that guide deliberate actions to accomplish land treatment. Conservation planning involves the use of inventory data for study, evaluation, and selection of the future courses of action. Each conservation plan is tailored to fit a particular unit of land by the landowner or operator with planning assistance from the Soil Conservation Service. SCS provides technical material and information on soils, water, animals, and plants which are needed by the landowner or operator in the decisionmaking process.

Technical assistance for land treatment is provided by SCS under authority of Public Law 46, 74th Congress. Assistance is given to landowners and operators through requests to local Soil and Water Conservation Districts. Financial assistance is available through the Agricultural Conservation Program (ACP) to install erosion control measures and other pollution control measures. The Agricultural Stabilization and Conservation Service administers the Agricultural Conservation Programs.

Authority for the ACP is provided in the Soil Conservation and Domestic Allotment Act of 1936. Objectives of the program are to control erosion and sedimentation, encourage voluntary compliance with Federal and State requirements to solve point and nonpoint source pollution, achieve priorities in the National Environmental Policy Act, improve water quality, encourage energy conservation measures, and assure a continued supply of necessary food and fiber for a strong and healthy people and economy. The program will be directed toward the solution of critical soil, water, energy, woodland, and pollution abatement problems on farms and ranches.

Conservation practices are to be used on agricultural land and must be performed satisfactorily and in accordance with applicable specifications. Wildlife conservation practices must also conserve soil or water. Program participants are responsible for the upkeep and maintenance of practices installed with cost-share assistance. Cost-share assistance does not apply if the primary purpose is to bring new land into production.

Yields of chief crops in the basin tend to be significantly lower than statewide averages. This implies that many farming operations are rather marginal. These farms have high erosion rates and are likely to be the ones least able to afford installation of currently used conservation practices, many of which have very high initial costs. Higher cost-sharing rates by USDA would be helpful, however, this would require new legislation and/or policy changes. The development and improvement of erosion control technology, such as the perfection and widespread adoption of conservation tillage, may provide less costly erosion control in the future.

Current cost-share payment up to 75 percent may be divided as a direct cost-share payment, or advance of conservation materials or services in lieu of payment.

Watershed Development

The Watershed Protection and Flood Prevention Act, Public Law 83-566, authorizes the Secretary of Agriculture to cooperate with States and local agencies in the planning and installation of works of improvement for soil conservation and for other purposes. It provides for technical, financial, and credit assistance by the Department to local organizations representing the people living in small watersheds. It also provides for needed additional treatment and protection of federally owned lands within such watersheds. Moreover, the Act provides for a project-type approach to solving land, water, and related resource problems. It requires that full initiative and maximum responsibility for any undertaking be exercised by local people through their local organizations.

A major purpose of the Act is watershed protection which is defined as the protection of the watershed area through the establishment of

land treatment measures to reduce erosion, sedimentation, and runoff where benefits accrue primarily onsite. Conservation land treatment measures would be installed at an accelerated rate through local soil and water conservation districts. Landowners or operators are responsible for the installation of conservation measures with technical assistance furnished by the Soil Conservation Service. Financial assistance can be obtained from the Agricultural Stabilization and Conservation Service, Farmers Home Administration, and PL-566 project funds. The local people must be willing to carry out all phases of project installation, operation and maintenance, and must have the financial ability or be able to make adequate financial arrangements for carrying out their full responsibilities with relation to the project.

Potential PL-566 watershed protection projects are shown on Map No. V-1.

Resource Conservation and Development

Section 102 of the Food and Agriculture Act of 1962, Public Law 87-703, as amended, provides the Soil Conservation Service with authority to assist local people in planning and carrying out resource conservation and development projects. The locally initiated and sponsored projects are designed to promote orderly conservation, improvement, development, and wise use of natural resources. Objectives also include initiating a long-range program of resource conservation and development for purposes of achieving a dynamic rural community with satisfactory level of income and pleasing environment, and creating a favorable investment climate attractive to private capital.

Technical and financial assistance is available only for RC&D areas authorized for assistance. Technical and financial assistance is available for the planning and installation of approved measures specified in RC&D area plan serving purposes such as flood prevention, sedimentation and erosion control, public water based recreation and fish and wildlife developments, agricultural water management purposes, water quality management, control and abatement of agriculture-related pollution.

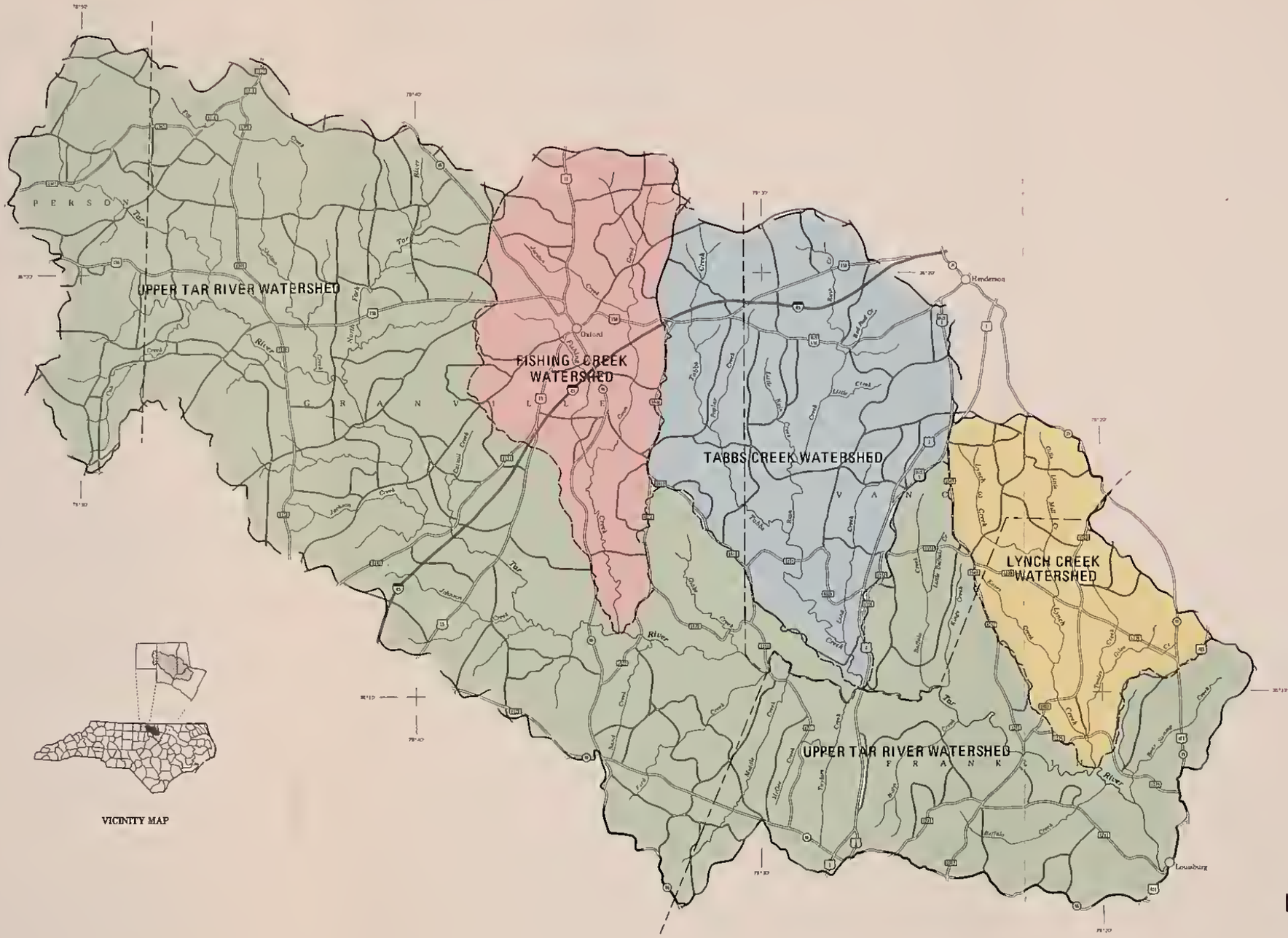
Rural Clean Water Program (RCWP)

The objectives of RCWP are to develop and test methods for improving water quality by assisting agricultural landowners in reducing agricultural nonpoint source pollutants. Authority is provided under Public Law 96-108, the Agriculture, Rural Development, and Related Agencies Appropriation Act of 1980.

The RCWP provides financial and technical assistance to private landowners and operators in approved project areas. The assistance is provided through long-term contracts of 3 to 10 years to install best management practices to solve critical water quality problems

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



BASE LEGEND

- INTERSTATE HIGHWAY
- U. S. HIGHWAY
- STATE HIGHWAY
- SECONDARY STATE HIGHWAY
- INTERSTATE ROAD
- PRIMARY RDAD
- SECONDARY ROAD
- TOWN
- ORAINAGE
- COUNTY BOUNOARY
- STUDY AREA BOUNDARY
- WATERSHED BOUNDARY

VICINITY MAP

Map V-1

POTENTIAL PL-566 PROJECTS

UPPER TAR RIVER BASIN STUDY AREA

Portions of
FRANKLIN, GRANVILLE, PERSON,
AND VANCE COUNTIES
NORTH CAROLINA

Material prepared by Field Personnel.
Maps generated by North Carolina Department of Natural Resources and Community Development, Land Resources Information Service.

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resulting from agricultural nonpoint source pollution. The project area must reflect the water quality priority concerns developed through the established water quality management process. Participation is voluntary.

RCWP is only applicable to privately owned agricultural lands in approved project areas. Any landowner or operator in an approved project area whose land or activity contributes to the areas water quality problems and who has an approved water quality plan may enter into an RCWP contract. An individual partnership, corporation (except corporations whose stock is publicly traded), Indian tribe, irrigation district, or other entities are eligible. Federal, State, or local governments, or subdivisions thereof, except irrigation districts, are not eligible.

Target Area Erosion Control

The Chief of the Soil Conservation Service has the authority to distribute funds to certain approved targeted areas for erosion control. A proposal has been developed for such an area, the Piedmont Bright Leaf Erosion Control Area of North Carolina and Virginia. The Upper Tar River study area lies entirely within the 13 county portion of North Carolina.

The objectives to be accomplished in the targeted area are:

1. Protection of the soil resource base and improvement of productive capability through a significant reduction in annual soil losses.

2. Improved water quality through sediment reduction and decreased runoff of pesticides and nutrients.

3. Increased soil organic matter levels to better utilize water and nutrients and improve effectiveness of agriculture chemicals.

4. Increased irrigation water efficiency.

5. Increased use of conservation tillage systems to prevent erosion, conserve moisture and save energy.

6. Increased use of fescue in tobacco rotations and use of conservation systems rather than individual practices.

7. Improved profit margins for the area's farmers.

A 10-year program is planned for the targeted counties to reduce erosion, improve irrigation water management, increase soil productivity, reduce water pollution and finally improve the income of the farmers. Through additional technical and financial assistance the program will help local landusers install needed conservation systems to accomplish the above goals.

A cost-share program is needed to accelerate the installation of conservation systems. Because of the number of small farms, it is recommended that cost-sharing be 75 percent federal and 25 percent supplied by local farmers. Cost-sharing would be based on the average cost of installing conservation systems and would be carried out through long term agreements between the farmer and USDA. Special ACP funds should be made available so that special emphasis can be placed on using ACP long term agreements and other cost-sharing.

Information and education work can be done by members of the Rural Development Panels, or by the agricultural agencies in counties that do not have Rural Development Panels. Adequate funding should be made available to the Agricultural Extension Service to provide an educational specialist in each state to work in the project area. These specialists would plan and conduct extensive media programs, coordinate demonstrations and test plots, conduct group meetings and seminars, coordinate information activities with other agencies, develop cost-benefit information for conservation systems and promote additional conservation research.

Forestry Incentives Program (FIP)

The objectives of FIP are to bring private nonindustrial forest land under intensified management; to increase timber production; to assure adequate supplies of timber; and to enhance other forest resources through a combination of public and private investments on the most productive sites on eligible individual or consolidated ownerships of efficient size and operation.

Cost-sharing of up to 75 percent of the total cost is available under the Forestry Incentives Program for tree planting and timber stand improvement. Special forestry practices may be approved if needs for a significant and unique local condition for which national FIP practices are not adequate. Owners of non-industrial private forest lands of 1,000 acres or less, capable of producing industrial wood crops are eligible for Forestry Incentives Program cost-sharing. In order for an individual within a county to receive Forestry Incentives Program funds, the county must be designated as a Forestry Incentives Program county by the State committee in consultation with the State Forester. In counties designated for Forestry Incentives Program, the individual landowner is required to have a forest management plan, developed by the State Forester and landowner.

North Carolina Forest Development Program

The Forest Development Program is designed to aid private landowners reforest after harvest and to place their idle and unproductive forest land into full timber production. Assistance is available from the North Carolina Division of Forest Resources, County Agricultural Extension Agents, and the ASCS.

Cooperative Forestry Assistance

The Cooperative Forestry Assistance Act provides funding and assistance to the State Foresters in programs on non-federal forest lands in the advancement of forest resources management; the production of timber; the prevention and control of insects, diseases and rural fires; the efficient utilization of wood and wood fiber; fish and wildlife habitat maintenance and improvement; and the planning and conduct of urban forestry programs.